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SIR GEORGE LIVESEY—A MAN AMONG MEN.

THE floodgates of sorrow and sympathy were opened wide on Saturday when Sir George Livesey—engineer, administrator, philanthropist, and lover of his fellow-men—was laid to his last rest in Nunhead Cemetery. It was a fitting seal to the final chapter of a life well lived and fruitful in enduring benefit and example—a life filled with work and deeds, the glory of which will never pass away. Striking indeed was the tribute paid to the memory of him who was so well-loved by those among whom he had lived and moved, and for whom he, with self-sacrificing energy, had done so much. The mourners were numbered by their thousands—from Sir George's contemporaries in the gas industry, from those one recognizes as its professional and administrative leaders, from representatives of the technical organizations to which Sir George belonged, from the officers of the South Metropolitan and South Suburban Gas Companies down through all stages of the workers, over the last-named of whom he had watched with supreme devotion and solicitude that were almost—nay, quite—paternal. Is there aught that can be said of such a one at the end of life that would be fulsome? As one carries in memory the sorrowing multitude, composed of all sorts and conditions of men, who called him with sincerity friend, leader, and master, all with faces eloquently expressive of those emotions that are prompted by the heart, there is only one answer. He was indeed well-beloved by his fellow-men; and the life that had been spent to the loftiest purpose had made him so. Throughout, he laboured with a clear objective and strong resolution; he used with skill those talents with which he had been generously endowed; he wielded with conscientious regard to trust and justice the secular power with which he was mantled. Sometimes his resolution, perseverance, and frankness brought him athwart the paths of men; but not for long. Sooner or later that large heart found the means of conciliation. But he is no more. We have lost a robust, humane, and noble leader, who has stood in the recent decades in the forefront of the fights for our industrial liberty. In the time to come, those of us who have seen our departed friend engaged in the various activities of his life, who have seen him in his varied moods—in the calm when task was congenial, in the thick of the fight when oppression had to be conquered, and he felt that justice was on his side—will often picture that tall spare figure, that rugged and strong but kindly countenance set with its keen and animated eyes, and wish that the figure was moving among us still, aiding with its powerful intellect and counsel, guiding steps, and assisting in the industry's work by the earnest generalship that commanded so much admiration and respect. But it cannot be. He has been taken from us; but it is the knowledge of us all that to him Death was but the gate to life eternal.

It seems an almost unnecessary work to do as was done last week, with supplement this, in these columns—trace the more prominent incidents in the life-work of Sir George. His whole life, save his benefactions (and he did untold good by stealth rather than that his neighbour should learn of it), is as an open book; and there is no intelligent being in the gas industry who could not outline, without reference, the story of this exceptionally full life of work and successful and valuable issues. When the multitude of sorrowing ones left behind them at Nunhead on Saturday, within the district of supply of the South Metropolitan Gas Company, all that was mortal of him they so much revered, they did so with a knowledge that he had left in this world of ours much fruit and much influence that will be, while the gas industry lasts, immortal. In our industrial life, the name of Sir George Livesey will always now rank in our minds even before the names of those who laid the foundations of the gas industry; for with his "lively vigour of genius," with his statesmanlike comprehension, he did—all freely agree—more than any other single man has ever done in shaping the ways of development during the period of the industry's greatest fructification. In all the channels of his work, the same characteristics may be traced. In all he was intrepid, thorough, and practical. In his engineering invention, the aphorism as to the making of two blades of grass grow where only one grew before, might always have been his actuating precept. He sought in his invention a progressive capital and working economy and a progressive efficiency. His large gasholders, perhaps more than anything else in his engineering career, showed in striking manner the talent for design, a dauntless enterprise, and an assurance where others had feared. But in bringing into reach greater economy, the humane side of Sir George was ever on the alert. There is not one of his several inventions that had any effect in the displacement of labour. We do not say that this was in any way intentional; it may have been the mere accident of his bent of mind. Be that as it may, he was ever strongly opposed to the adoption of mechanical appliances, unless they showed conclusively a distinct economy and efficiency over manual work. This is a traditional line of action with the Livesey family. "My father," he once said to the writer, "charged me never to replace a "man by a machine unless there was some clear advantage, "and then always to have a leaning towards the man, to "whom and his dependents employment means so much." Never was man more sorely tried to disrespect the charge. But he heeded his father's words, and mechanical operation has only been adopted within his influence where there would have been real loss by refusing installation. But whereas mechanical appliances are often adopted in gas-works as a guard against the restlessness of labour, no such guard has, since the South London gas strike, been required at the works with which Sir George has had administrative connection, due to a labour policy that has had no equal, but which is proving each passing day to have been founded and developed with a clear perception of "coming events."

What has been done in this respect—and what has been done has had distinguished success—brought about something that Sir George always regarded as the perfecting of the sliding-scale that he propounded in 1875, and which has been since very rightly described as the *Magna Charta* of statutorily controlled joint-stock gas enterprise. Thereafter, shareholders and consumers participated in the profits of trading, making it to the advantage of the one to patronize and to the advantage of the other to do all possible to encourage patronage. But while the two shared in prosperity, the workmen did not; and from the ashes of the strike there rose profit-sharing which has expanded into the more appropriate co-partnership, even in administration. In this co-partnership, the depth of the sympathetic nature of its founder is seen; and of the many scintillating gems in the work of this one life, the richest of all—magnificent as the others are—is this one of co-partnership. He was fond of pointing out how co-partnership effects a unity of interests between shareholders, consumers, and workers; but it does something more—it helps to knit, within the sphere of its influence, the social threads of mankind in one piece. And the workers have proved their sincere appreciation. It was not only in this direction that Sir George worked for labour; many are the other privileges now enjoyed by gas workers through his advocacy. He also ever answered the call to public service in official investigation of general matters that affected the country's workers. Perhaps it was due more than anything else to his voluntary labour in helping to penetrate these social problems that caused the King to show his regard in the signal manner that he did.

Within the last dozen years or so, the gas industry has felt more than ever before the impeding power of the ballast that

capriciousness and short-sightedness had imposed upon it; and no one has worked with greater zeal than Sir George in getting this lightened. The standard of illuminating power has been reduced, and the anomalous method of testing the lower standards removed; while the sulphur compounds clauses have been annulled, chiefly through his exertions. The record, in which these are only points, is monumental; and it offers several lessons as to the efficacy in work of a resolute and bold spirit. But the need of all this work was mirrored in his inner supervision, as Chairman, of the affairs of the South Metropolitan and South Suburban Gas Companies. In these concerns, cheap gas was the objective; and it was an unsparing voice that condemned local extravagance or undue exaction which negatived endeavours to give the consumer further advantage. In professional deliberation, too, Sir George took prominent part.

It was a model life, though the tension of it was not perhaps sufficiently relaxed in later years. The old nature could not be altered; and it could not fully understand any devolution of a long-retained personal responsibility. However, the name of Livesey is to be continued, in official position, in the gas industry; and we feel sure that, through the sons (one is already in the industry, the future of the other has yet to be determined) of the late Mr. Frank Livesey, the honour of name and fame will be scrupulously safeguarded as a sacred trust.

Stand-by Supplies.

In the article—"Under Present Parliamentary Practice"—that appeared last week, the inequality of statutory power allowed to electricity and gas undertakings in respect of stand-by supplies was one of the subjects of comment. From information since received, the question is seen to be one that demands the very serious attention of gas men; and there must be perseverance in the attempt to secure protection. It is not suggested that electricity suppliers should be denied the power to insist on compensatory payment where a private electricity generating plant exists, and a stand-by supply from the town distributing-mains is provided. What is contended is that gas undertakings should be endowed with similar faculty in the case of manufacturers owning independent producer or suction-gas plants, and demanding a supply of town gas, and using it solely, as a stand-by to tide them over the difficulties that are—the existence of a desire for the stand-by is the confirming evidence—inseparable from such plants. Any dispassionate inquirer into this matter would be completely nonplussed in advancing a reason for the distinction that Parliament has created, and has so far firmly adhered to, as between electricity and gas suppliers.

The question is one that affects most gas undertakings, but more particularly those in manufacturing centres. Manufacturers there are who have adopted suction gas or similar plants who look upon the claims of gas suppliers to compensation for the expense to which they are put as being but common justice; but selfishness predominates, and selfishness offers strenuous resistance. The manufacturer who wants to run his engines working off suction-gas plant the full number of his employees' working hours, finds difficulty in doing so. There is the time spent in starting-up and in clearing the valves during the day of their tarry accumulations. A case has come to notice in which the time expended in starting-up and in dealing with other troubles absorbs several hours a week—from a few hours to (records show) as many as sixteen. Under such circumstances, the demand for stand-by gas supplies to tide over these troubles, and to save valuable time, is increasing, with the expanding experience of manufacturers, who are in the first place tempted alone by the low figures quoted per brake horse power by the use of suction gas, without any regard for the annoyances and expense, and loss of driving power, to which they are inevitably subjected after the adoption of such plants. There is within knowledge the case of a manufacturer who has installed gas-engines coupled-up to suction-gas plants. He recently required a supply of gas from the town mains, but the main running past his premises was not equal to the load; and the only way the volume of his requirements for filling the gaps in the service of his suction-gas plants could be satisfied was by relaying in larger size a considerable length of gas-main. Quite willingly this manufacturer paid £250 towards the cost of the relaying and the installation of a hundred-light meter, and felt a relief in getting a permanent and dependable supply of gas of fairly uniform calorific value. But not all manufacturers are prepared to look quite so graciously upon the service rendered to them, and the assurance conferred, by town gas. In another town, a manufacturer has recently had a suction-gas plant installed, displacing a fairly considerable consumption of town gas at a low power-price. But that manufacturer felt aggrieved, and declined to listen to reason, when informed that his casual power consumption would thenceforth have to be charged at the ordinary lighting rate. In the matter of this remnant consumption, however, he is in the hands of the supplying Company, and has had to bend to their determination in the matter.

There are many who believe that low-priced town gas and experience with suction plants, will combine to squeeze these competitors out. It is clear they are losing their attractions among certain users, on account of loss of time, inequality qualitatively of the gas, and the necessity (to ensure constant running) of having a secondary supply of gas available from the town mains. In evidence is the case of a manufacturer who is at the present time negotiating in an industrial town for a supply of town gas for an extension of his works, though the engines in the old part have suction-gas plants linked up to them. His reasons for the projected change are that, with lost time and the variations in the quality of the suction gas, he is not getting the service and the mechanical efficiency out of his engines that at the start he had been given to understand would be his reward by adopting plant. Electricians are of opinion that electric driving is going to carry all before it; but they work themselves up into this belief on the small rays of cheering light produced by isolated cases of manufacturers adopting electric motors. They overlook the fact that the gas-engine industry flourishes—and flourishes abundantly; and that present omens are that the suction-gas plant will eventually prove to be a blessing in disguise to the gas industry by inducing the installation of gas-engines, which may hereafter, through sheer disgust produced by experience, be fed by town gas. Meanwhile, proper compensation, not exaction, is required for the stand-by gas supply; and there must be persistence in the application until the equity of what is asked for is recognized by the Legislature.

Gas Making in Mond Producers.

In June last year we were taken to task by the Secretary of the South Staffordshire Mond Gas (Power and Heating) Company for having, in the course of an editorial article entitled "Gas or Ammonia," made statements in regard to the production of ammonia and gas in Mond producers, which, it was said, reflected detrimentally on the ordinary mode of working the producers, and on the resultant gas. ("Journal," Vol. XCVIII., pp. 503, 820.) Since the Company in question are practically restricted, by the limitations in respect of the composition of the gas imposed on them by their Act of Parliament, to working their Mond producers in the ordinary way, our comments applied in particular to the operations of that Company. They were prompted by the results obtained by Professor W. A. Bone, F.R.S., and Mr. R. Vernon Wheeler in experiments made with a Mond producer plant at an iron and steel works at Warrington. Briefly, it was shown by these experiments that the use of steam (over and above that required to saturate the blast at 60° C.) did not lead to a higher thermal efficiency of the producer, while saturation at an appreciably higher temperature was requisite for the highest yield of ammonia. That is to say, the plant may be used primarily for the production of good gas—in which case the yield of ammonia is so low that its recovery may be virtually neglected, or the plant may be used primarily as an ammonia producer—in which case the quality of the gas made is relatively inferior. Or, of course, a compromise may be effected, and a moderate yield of ammonia and a moderately good gas secured. We preferred to regard the Mond producer as ordinarily worked as being primarily an ammonia making plant—a view that had earlier been expressed in at least one well-known text-book on gas manufacture. No doubt, the South Staffordshire Mond Gas Company would have been better pleased had we credited them with adopting the middle course—*i.e.*, of compromising between the manufacture of a high-grade fuel gas and the production of a maximum quantity of ammonia. But middle courses are apt to prove disastrous to those who essay them.

Dr. Bone and Mr. Wheeler raised the question whether the thermal efficiency would really be further improved if the

steam-saturation temperature of the blast were reduced below 60° C. In May last year, they were only able to predict that, "possibly and indeed probably," it would be, and to promise trials in that direction. These trials have now been made, and the results were reported in a paper which Dr. Bone and Mr. Wheeler have just read before the Iron and Steel Institute. A summary of the paper, entitled "Further "Experiments upon Gas Producer Practice," is given on another page of to-day's "JOURNAL;" and it is fully as deserving of careful perusal as the earlier communication by the same authors. Gas engineers will not be surprised that the lowering of the steam saturation temperature of the blast has been attended with improved results; for they know there is no gain through the admission of more than a very moderate proportion of water vapour to the producers of retort-furnaces. But the present paper gives precise figures as to the effect of reduction in the proportion of steam in a producer of the Mond type, using bituminous coal.

Briefly, it is proved that, with steam saturation temperatures ranging down to 45° C., there is an improvement in the rate of gasification, and in the quality of the gas, as compared with the trials made with steam saturation temperatures above 60° C.; while the thermal efficiency of the working is practically as high. How great is the improvement in the gas, as compared with ordinary Mond gas, may be judged from the fact that the proportion of carbonic acid has fallen below 3 per cent., and the calorific value is about 180 B.Th.U. per cubic foot (at 0° C. and 760 mm.), or, say, 168·5 B.Th.U. per cubic foot at 15° C. and 30 inches. The latter figure compares with the mean value of 148·1 B.Th.U. quoted by the Secretary for the gas supplied by the South Staffordshire Mond Gas Company. We cannot compare the yields of gas per ton of coal, because the Company have not given theirs. But it is a significant fact that Dr. Bone and Mr. Wheeler appear to have said nothing about the yield of ammonia; so it may be presumed that, with the attainment of good gas-making conditions, ammonia recovery has gone by the board. It would be interesting to know in how many of the existing Mond gas plants, ammonia recovery is still practised, and what is the average yield per ton of coal over them all. It must be observed, however, that the proportion of carbonic oxide in the gas made in the latest trials by Dr. Bone and Mr. Wheeler rose to over 30 per cent.—a figure which statutory obligations preclude the South Staffordshire Company from emulating. But the authors of the paper lay stress on the greater furnace efficiency which a high proportion of carbonic oxide confers on a fuel gas, and on its constituting no disadvantage when the gas is used in gas-engines. Hence it is evident that the ordinary or Company's Mond gas is relatively inferior. Neither can the claim that the Company's supply is more regular in quality continue to be made; for emphasis is laid in the present paper on the fact that the variations in the load upon the producer, as worked by the authors, in no way affected the quality of the gas.

The lessons taught by these latest researches of Dr. Bone and Mr. Wheeler will be fully appreciated by gas-works' engineers, who will learn therefrom what they may expect in the way of competition with the supply of town gas for heating and power purposes from private producer plants using bituminous coal to the best advantage. But at least such competition affects only one section of the ordinary gas undertaking's business, and that a relatively small one; whereas it must cut into the very heart of the business in the supply of gas for power and heating operations which the South Staffordshire Mond Gas Company have been making strenuous efforts to secure, and on which their ultimate survival must depend.

A New Co-Partnership Scheme.

ONE of the features of the history of the gas industry in this year 1908 will be the fresh applications of the principles of co-partnership—a feature which gave the protagonist of the movement so much delight in the closing months of his life. Had Sir George Livesey lived but a few days longer, he would have had the further gratification of witnessing an attempt by Sir Christopher Furness to establish it in the shipbuilding trade. Though the offer on the part of Sir Christopher, as the representative of Messrs. Furness, Withy, and Co., is a voluntary one, on different lines from the system which has been applied in the gas industry (and while welcome is given to it), we cannot help feeling that, as a lesson, the importance of the offer rests as much on the fact that the firm has been driven to the wall before making the suggestion, and that they find it the most feasible way out of an awkward dilemma. The apostle of peace in the gas industry was for ever urging that initiation of such a movement should really begin before the compulsory stage had been reached. The offer by Sir Christopher Furness was made the other day at a conference of Trade Union representatives at West Hartlepool. He described the object of the scheme as being for the settlement of trade disputes without resorting to strikes and lock-outs. But, as showing the position in which the firm had arrived, these words are eloquent of the *cul de sac*. "Troubles," said Sir Christopher, "between employers and employees have been "so insistent in the shipbuilding trade of late, that the firm "have incurred a heavy loss on this branch of their business, "and they therefore propose to give it up, unless some "guarantee of industrial peace can be given for the future." The seriousness of this proclamation is of far-reaching importance; and the Trade Unionists and their new associates the Socialists, who are doing their best to drive British capital out of the country and to strangle the industry that gives them their daily bread, should consider it carefully. Sir Christopher has taken well to heart an old article of belief of the sentient counsellor of the movement in the gas industry. "If"—one might almost imagine this was the voice of Sir George Livesey—"the industries of the country "are to be retained, the relations between capital and labour "must be so adjusted that it will be in the direct interest of "both to work to one and the same end."

The first proposition of Sir Christopher Furness—that the Trade Unions and their members should be both capitalists and workers, and take over the shipbuilding yards at a price to be settled by recognized assessors to be jointly nominated—is rather humorous. The alternative of co-partnership seems the more acceptable. In effect, the scheme is that the men should be invited to become co-partners; the initial condition being that the employee partners should prove their faith by becoming holders of special shares, to be called "employee shares," paying for them by agreeing to a deduction of 5 per cent. from their earnings. These special shares, whether or not the Company earn any surplus profits, are to receive a fixed interest of 4 per cent. In lieu of workmen directors, it is proposed to have a Works Council. In this way friendly intercommunication between firm and employees would be promoted, and their interests would be common. Of course, the great difference between this proposal and that obtaining in the gas industry is that in the latter the men's holdings of stock or shares are not obtained by a deduction from wages, but by something taken from profits over and above the men's earnings. But this is a shipbuilding firm, subject to vigorous vacillation in prosperity and otherwise. It is therefore a big consideration for the men that they are (if the scheme is agreed upon) to be entitled to a fixed interest of 4 per cent., whatever be the state of the profits. The men have not yet come to any determination in the matter; and the Socialists may be depended upon to do their best to divert them from acceptance. The attitude of the Socialists on this question is well exemplified by the vulgar denunciation of co-partnership by one of their organs, in its first issue after Sir George Livesey's death. Co-partnership supplies an all too short cut to participation in the profits of industry to please those who live by agitation, and who have a personal interest in making the road to the goal as long as possible.

The New Junior Association Session.

It may now be said that the new session of the various Junior Gas Associations is in full swing. In last week's "JOURNAL" we reported the proceedings of the opening meeting of the Manchester Association; to-day the Midland Association and the Eastern District of the Scottish Association are noticed; in our next issue it will be the turn of the Yorkshire Association; and the week after that will come the London—which, with the Western District of the Scottish Association, completes the tale. In all directions, the session is opening in a manner which shows that the Associations have lost none of their vitality, and hold out every promise of long continuing the useful work which they have already performed. At Birmingham, on Saturday, the presidential chair was taken by Mr. James Hewett, who, as was remarked at the meeting, has certainly thoroughly well earned the honour that has been conferred upon him, by his unceasing efforts to forward the interests of the Association. No one can have the welfare of the organization more closely at heart than

he has. This, however, is not Mr. Hewett's only title to the position that he now fills—as he has already shown by his Inaugural Address. Casting aside all idea of confining his remarks to a general summing up of the position of the gas industry, he plunged straight into one subject with regard to which circumstances enable him to speak authoritatively—and there he remained. The result was that his address, instead of being of more or less passing interest, will possess lasting usefulness as a contribution to the not too plentiful literature of the subject with which it deals—namely, the design and size of waggons for the transport of coal for gas-works. The question of employing larger waggons than have hitherto been general for the carrying of coal has long been discussed, and its importance has been fully recognized. What has been done in connection with the Birmingham Corporation Gas Department in the direction of providing a limited number of 20-ton hoppered steel waggons in connection with their coal traffic should therefore prove of value to other undertakings. The meeting also heard read a paper on "Retort-House Work and Practice," by Mr. F. J. Ward, of Knowle, which promises to lead to a good discussion at the next meeting, to which it stands adjourned. The paper was, in the author's words, a plea for "more enlightened and careful handling of the plant as it exists," rather than to advocate the adoption of new schemes to render large makes of gas easy of attainment.

A Bed of Roses at Devonport.

It will be pleasant news for candidates for the position of Engineer and Manager of the Devonport Gas-Works that, in the opinion at least of some members of the Town Council, the gentleman who may have the good fortune to fill it will have "a bed of roses." Those who have occupied the post under the Corporation have, perhaps, hardly found it the "soft job" which this metaphor suggests. It is true that they have been engaged upon work of reconstruction which is now approaching completion, and that the new Engineer will have the advantage of more modern and up-to-date plant than his predecessors had to work with. This, however, will not make the position altogether an easy one. If in one respect the work is lighter, the responsibility will be none the less. Judging from the debate at last week's meeting of the Council, the new Engineer and Manager will find abundant occupation for any talent he may possess in making the undertaking pay its way for the next few years. Into the merits of the dispute over the contract for the maintenance of the prepayment meter installations we are fortunately not called upon to enter. The consideration of the matter may be left to the Special Committee the Council appointed, who will, no doubt, endeavour to fix the measure of responsibility for entering into an engagement which some of the members now regard as onerous, and may suggest means for reducing the financial burden which it is said to entail. What at present seems remarkable is that such an agreement should have been drawn up, signed, and sealed without anyone apparently knowing anything about it, and without any record of its having been discussed and approved by the responsible Committee. However, more will be heard about this in the future. For the present, it is sufficient to say that it is likely to be a pretty sharp thorn in the future Manager's "bed of roses." It formed, moreover, an excuse with some of the members for cutting down his salary by £50, though this little economy was, no doubt, partly a tribute to the fact that the Council are in sight of Nov. 1 and its elections.

A Distrusted Gas Committee.

One of the advantages claimed by the advocates of the municipal management of industrial undertakings is the economy resulting from the substitution of an unpaid committee of the local authority for a paid board of directors. It is confidently expected that under town ownership the property will not only pay its way, but furnish each year a substantial amount in relief of the rates; and the section of the council told off to conduct the concern are looked to for a realization of this expectation. In technical and some administrative matters the committee generally have the good sense to be guided by their engineer and manager; and when, as the result of their combined prolonged deliberations, a particular line of policy is recommended to the council, it is a little disheartening to have it coldly received, and referred back to them for further consideration. This, however, is what has just happened at Stockport, as will be seen from an account given elsewhere of some proceedings at the meeting of the Town Council last Wednesday. The position was this: The Gas Committee found themselves face to face with the competition of small suction-gas plants installed by manufacturers using gas for power; and, as the result of the study of a report made to them by their Engineer (Mr. S. Meunier), they submitted for the approval of the Council a scale of discounts specially calculated to induce large consumers to continue the use of coal gas. The proposal was objected to on the ground that if the Committee could afford to make a reduction to one section of their customers they should make one all round. But why, as one member of the Council asked, should these large consumers be made to wait, and thus handicap the trade of the town? The Chairman of the Committee (Mr. J. Fernley) said they had had this matter under consideration for twelve months, and the reduction they proposed had been forced upon them by the increased competition of suction gas. He pointed out the importance of maintaining the day-load, and reminded the Council that it was the large consumers who enabled them to do this. The Committee therefore offered them an inducement to continue their support. They were quite unanimous in their decision; and he thought it somewhat unfair that the Council should seek to take from them the responsibilities with which they were entrusted. He very properly objected to members getting up and talking about matters they did not understand; and added that if the Committee adopted the policy laid down by some people, there would be no gas profits to distribute. He agreed to take the matter back, but assured the Council that the Committee would persist in making the reduction. It seems to us that they are to be commended for their determination. On another subject the Chairman of the Committee showed less firmness. It had been resolved that the members should visit the Franco-British Exhibition, doubtless with the object of picking up information in regard to the lighting there. But as the resolution had created an impression that the Committee were simply going to have a trip at the ratepayers' expense, it was withdrawn. In making the announcement in the Council, the Chairman said he thought, in view of the good work the Committee had done for many years, they might have been trusted to do what was right; and so should we. There appears, however, to be an unjustifiable distrust of the Committee, the continuance of which will not be to the financial advantage of the gas undertaking.

Unreliability.

The warnings of the unreliability of electricity supply from central stations continue to be made. It is a matter of note how small a defect may cause a maximum amount of inconvenience and difficulty. It came as a surprise to many electricians to learn that, at the height of the public patronage of the District Railway and certain of the London tube lines on the afternoon of last Saturday week, there was a cessation of the electrical energy from Lot's Road generating station, stopping trains and lifts and putting in darkness trains and stations, without the slightest warning. And it all happened through "a 'surge' of the high-tension current" at the generating-station causing "some control switches to fuse." That such a small matter could disturb traffic to such a degree for a whole afternoon is something that had not been suspected. The generating-station, it is stated, has been built on the most modern and approved lines; and no effort or expense has been spared to render it as perfect and secure as science and knowledge can make it. But "modern and approved lines," and all effort and expense, did not prevent this *contretemps*. Happening here, a similar thing may happen anywhere. The same afternoon the Surbiton-Kingston trams also had their activity suspended through the stoppage of current. In last week's issue of the "JOURNAL," a breakdown of the electricity supply was reported from Ashton-under-Lyne; and on Sept. 29 reference was made in our "Electricity Supply Memoranda" to other collapses. Only last Friday evening, there was a fire at the County of London Electricity Supply Company's generating station at Oak Wharf, City Road. Not much damage was done; but "some inconvenience was caused to consumers." Verily these continual breakdowns must be a source of confusion to those central station managers who herald the reliability of the electric light. Owing to a failure of the supply of electric current, the Bedford Hotel,

Southampton Row, presented at about six o'clock last Friday evening a curious spectacle; visitors being found sitting about the lounges endeavouring to catch a glimpse of each other's faces by means of the very mild light that was shed by candles stuck into the necks of bottles. In fairness, however, it must be said that the attendants displayed the greatest readiness to guide strangers safely about in the darkness which prevailed. The electric light failed at St. Mary's Church, Maidenhead, on the occasion of the Harvest Festival; and a quantity of candles and lamps had to be obtained in order that the evening service might be proceeded with.

Miners in Congress.

From one cause and another—principally owing to the introduction of the Eight Hours Bill—the affairs of the coal miners of the country have of late been more than usually before the public. This has doubtless been responsible for some share of the attention which has been paid to the conference of the Miners' Federation of Great Britain which was held last week at Chester, though in any event, of course, the gathering would be of importance to those directly connected with the industry. The delegates (who numbered 157, representing close upon 600,000 Trade Unionists) were presided over by Mr. Enoch Edwards, M.P., whose address opened with an expression of satisfaction at the growth of the Federation, and with a reference to the fact that wages were much higher to-day than at any period except a boom. Doubtless he would group the two together as being a case of "cause and effect." The first resolution agreed to by the conference was that the mining royalties ought to be the property of the State, and that the subject should be remitted to the Executive with the view of introducing a Bill. A suggestion that the age limit for old-age pensions ought to be reduced to 60 years naturally found favour, as it would represent a real gain to the workers; but the same argument cannot with certainty be advanced in explanation of the passing by the delegates of a motion—"That, in the opinion of this Federation, the workers cannot obtain the full value of their labour and disputes be avoided until the land, minerals, mines, railways, and whole means of pruduction, distribution, and exchange are owned and managed by the State for the people." Such a proposition in the abstract is, however, harmless enough—which is more than can be said for a resolution from Northumberland—"That no colliery in the Federation area work more than five days per week." The mover of the latter proposition made no reference to the Eight Hours Bill; but the President advised the delegates to defer the question until the uniform eight-hours day had been obtained—urging that it would be a big mistake to open up the matter at the present time. In the end, it was agreed to refer the subject to the Executive Committee. The question, therefore, is at rest for a time; but the importance of the resolution lies in the way in which it emphasizes the fact that even the eight-hours day might not, if secured, permanently settle the question of the coal miners' working week. Two matters were discussed in private at the end of the conference; but both were agreed to. The first was in support of the claim of the Scottish miners to have a minimum wage rate of not less than 6s. per day; and the second was that the Federation should make formal application for admission to the ranks of the Labour Party.

We are sorry to learn that Mr. L. S. Adlington, son of Mr. E. L. Adlington, the Engineer and Manager of the Worcester Gas-Works, met with an accident when motor cycling last Wednesday from Worcester to Oxford. When at Broadway, a collision with a cart occurred, as the result of which one of his legs was fractured. He was promptly attended to locally, and then removed to Worcester, where he is making good progress.

We learn that Mr. P. J. Smithers was appointed teacher in the subject of "Gas Supply" at the Westminster Technical Institute of the London County Council Education Department, and that, owing to the number of pupils being larger than was originally expected, Mr. H. Rothwell has since been selected as joint teacher with him. This, it may be pointed out, is an entirely new branch of the Institute's work; and it bids fair to be one of the most sought after of the many classes held there. Both Mr. Rothwell and Mr. Smithers have taken a prominent part in the work of the London and Southern District Junior Gas Association; the former occupying at the present time the position of Senior Vice-President, while the latter is a member of the Council. The new classes will be watched with interest; and we trust the success attending them will be as great as there is every reason to anticipate will be the case.

PERSONAL.

It is with extreme gratification, which will be shared by a vast number of our readers, that we learn from the son-in-law of Mr. G. F. L. FOULGER, the Chief Distributing Engineer of the Gaslight and Coke Company, that he is making splendid progress after the operation he has had to undergo, and which has deprived him of one of his legs. A point that is as singular to Mr. Foulger as to his friends is that, until Friday, the 2nd inst., he suffered no inconvenience that indicated the presence of any disease whatever, much less a disease that would have such a grave termination. At the utmost there was an occasional twitching that was merely suggestive of a little muscular disturbance, but nothing more. However, the operation was most skilfully performed. The amputation of the leg was at the hip; and this, being well above the affected part, reduces all apprehension of a recurrence. The eminent surgeons engaged in the case held a further consultation last Sunday, and testify that, owing to Mr. Foulger's excellent constitution and nerve, he will shortly be in as complete a state of health as he has always enjoyed—the exception being the substitution of an artificial limb for a real one. A casual remark by the surgeon—that there has been no more increase of temperature than would result from an ordinary tooth extraction—is very reassuring. Another good feature is that the old cheerful disposition of Mr. Foulger is found in the patient. Therefore, with other friends, we are looking to as speedy a recovery as circumstances will allow, and shall in due season welcome him back to those activities with which his name has been so long and so honourably associated.

The Jubilee of the Oxford Museum, which opened at noon last Wednesday with a Convocation in the Sheldonian Theatre, was rendered specially interesting to our readers from the fact that the recipient of one of the two honorary degrees of Doctor of Science conferred on the occasion was Mr. A. G. VERNON HARCOURT, M.A., F.R.S., of Christ Church, one of the Metropolitan Gas Referees, and the inventor of the well-known pentane lamp bearing his name. The subsequent proceedings included an interesting lecture on "The Early History of the Museum," by Dr. Harcourt. In the course of it he recounted how, fifty years ago, he was getting together the apparatus for Brodie's first course of lectures in the museum—having become his lecture assistant, though he had not taken his degree. A year later he was made demonstrator in the students' laboratory. A hearty vote of thanks was accorded to Dr. Harcourt for his address.

At the meeting of the Hull City Council last Thursday, the three candidates recommended by the Water and Gas Committee for the position of Engineer, in succession to Mr. F. J. Bancroft, B.Sc., who has succeeded Mr. T. H. Martin at Barnet, were in attendance. The names were voted upon by ballot, and resulted in the selection of Mr. C. B. NEWTON, who was called into the chamber and congratulated on his appointment. The successful candidate was a few years ago Gas and Water Engineer to the Carlisle Corporation.

Gas at the Medical Exhibition.

In connection with the fourth annual Medical Exhibition organized by the "British and Colonial Druggist," which was held last week at the Horticultural Hall, Westminster, the Gaslight and Coke Company followed their usual custom of having a stall for the distribution of literature, &c.; but on this occasion they added a small but select display of gas lighting and heating appliances. There were two stoves, one at each end of the stand, of types which are specially adapted for the medical profession—one a Wilsons and Mathiesons "Sheraton," white enamelled, with boiling-ring at top, and the other a Fletcher-Russell "Anglia," in green enamel, with air-warming arrangement, which gives it a large heating power. There were in action some "Metrolite" burners with suitable Evered fittings, as well as some New Inverted (Nico) burners, with special gas adjustment. The fitting which, however, probably received the greatest amount of attention was a Best and Lloyd "Surprise" bracket arranged for surgical and dental purposes. The bracket is arranged to move in all possible directions; and an ordinary "C" burner can be used on it, as the counterbalance enables it to withstand the vibration. With the addition of a Telschow reflector, a convenient and most powerful light is obtained, of a much whiter nature than is secured by electricity. This was a fact which could be demonstrated at the exhibition, for opposite the gas stand was a surgical bracket lighted by a Nernst lamp.

North British Association of Gas Managers.—We have received the report of the proceedings at the 47th annual meeting of the Association, which was held in Edinburgh on the 23rd and 24th of July last, under the presidency of Mr. William Blair, of Helensburgh. The contents comprise the papers read and reports of the discussions upon them, the rules of the Association, lists of Past-Presidents, office-bearers, and members, and the accounts. Following the particulars specially referring to the Association is the Statistical Report of the Gas Supply of Scotland from May 15, 1907, to May 15, 1908, compiled by the Committee, which is also issued as a pamphlet. The whole has been produced under the supervision of Mr. Lawrence Hislop, of Uddingston, the Secretary and Treasurer of the Association.

THE LATE SIR GEORGE LIVESEY.

Co-Partners in Business; Co-Partners in Grief.

In the memory of all who took part in it by their presence, the funeral of Sir George Livesey will remain to their dying days. From the beginning to the end, there was a grand appropriateness about it all. He had lived largely for his people; his people—an army of them—accompanied him reverentially to his last resting-place on Saturday, which was the thirty-seventh anniversary of the death of his father. The home at Reigate was left on Friday evening; and there could have been no happier conception than that the body should be delivered into the care of those among whom he had laboured, and should rest the night, guarded by workers, on the very scene of many triumphant achievements of a remarkable life's work. In the centre of the hall of the well-known offices in the Old Kent Road Gas-Works, with walls lined with the rich floral tokens of affection and regard from rich and poor alike—from those immediately dear to him, from the colleagues of the Board-room to the colleagues of lowliest position on the works—the coffin stood on its rests, with the feet of the body towards the stairs that they had trodden over many a long year. It was a fit and worthy resting-place; and it was this scene that met the eye on Saturday morning.

At all the works of the South Metropolitan Gas Company and at those of the South Suburban Gas Company, work ceased for the day. Gasholders were well filled, fires were banked, the whir and the rattle of the machinery was not to be heard. The chief was dead; and it was the day of mourning. From nine to one o'clock the workmen of both Companies passed in, in silent stream, at the old Canal Bridge entrance of the works, wended their way to the offices, and filed through the hall and round the coffin that contained the remains of him who had been their staunchest friend, who had secured for them so many privileges, and who had done, with singularly abundant success, so much to improve their lot—materially and otherwise—in life. They gazed upon the coffin, and upon the plate that bore the simple, plain inscription which covered a great history—

George Thomas Livesey.
Born 8th April, 1834,
Died 4th October, 1908.

There was many a moist eye; many a trembling lip. At 1.30 p.m., the marshalling of the huge procession that was to accompany the body to Nunhead Cemetery commenced. As the coffin was brought from its resting-place, and deposited in the hearse, the works' band played the Dead March. The *cortége* left by the main entrance. There was the hearse bearing the coffin richly decked with its floral tributes; and two other vehicles also bearing their loads of lovely wreaths—fitting emblems of a rich and pure life. Then followed the carriages containing the chief mourners, relatives and personal friends, including the Directors and chief officials of the two Companies, representatives of the other Metropolitan Gas Companies and of the principal technical organizations with which the deceased was connected, with the long train of staff officers and workmen of the two Companies following; the men from each works forming divisions headed by their own Engineers and officers. Of the South Metropolitan men, there were approximately 6000, and of the South Suburban men about 635. It was a great silent army, bent on doing honour in a manner in which honour was due. Let no man henceforth say that the good seed that has been scattered by the departed sower has not taken root. With officers and friends, there were probably not far short of 7000 following this leader of men to the grave. With the men walking four abreast, it took over half an hour for the great procession to pass any given point. It was not ostentation; it was pure affection, and a desire to perform the last possible respect that brought this vast, composite multitude together. And so far as the workmen were concerned, the beauty of this marvellous demonstration was that it was purely voluntary on their part. Mural posters in the works simply stated that "all who desire to follow will assemble inside the Old Kent Road works" before 1.30 p.m. There were, as stated, approximately 6600 men of the two Companies who did "desire to follow;" and who could say them nay? Of course, with such a vast following, no one could possibly note, and no one thought of doing so, the names of men present or absent. Anyone who may entertain even the shadow of suspicion that there was anything but spontaneity, may dismiss it as an idle and unworthy thought, and a thought which, if expressed, would be an insult to the men.

In the carriages between the vehicles bearing the floral tributes and the marching army of officers and men were:

Carriage.		Carriage.	
1.	Miss Mary Livesey Miss Hilda Livesey Mr. F. Livesey Mr. G. Livesey	9.	Mr. F. M'Leod Mr. S. Y. Shoubridge Mr. Charles Ohren Mr. H. Manley
2.	Miss Naomi Livesey Miss Jean Livesey Mrs. Keddell Mr. Keddell	10.	Mr. Corbet Woodall Mr. H. E. Jones Mr. W. G. Bradshaw Mr. Thomas Newbigging
3.	Family Servants		
4.	Mr. R. Morton Mr. J. Ewart Mr. J. Mews Mr. F. Bush	11.	Mr. L. Rostron Mr. William King Mr. J. Washington Mr. Walter King
5.	Mr. Jabez Light Sir F. Flannery Mr. Charles Hunt Mr. J. Boraston	12.	Mr. Thomas Glover Mr. J. W. Helps Mr. A. Wilson Mr. W. Doig Gibb
6.	Mrs. Harrison Miss Harrison Mr. Hanbury Thomas Mr. Harry Keddell	13.	Mr. J. Durant Mr. W. J. Liberty Mr. J. Surman Mr. T. Drumgold
7.	Mr. H. Austin Mr C. Drumgold Mr. R. Wyllie Mr. W. Waller	14.	Mr. E. Wood Mr. G. E. Clark Rev. Canon Clark
8.	Mr. Chas Mortimer Dr. Ward Mr. J. A. Butcher Mr. L. N. S. Pasmore	15.	Mr. W. S Campbell Capt. W. E. Webb Mr. J. T. Rae Mr. Stephen Collins, M P.

Among the occupants of the carriages, it will be seen, was Mr. John Durant. To those who knew his history, he was an interesting personality. He is in his 98th year; and he came up from Weybridge specially to be present at the funeral. Mr. Durant is the oldest pensioner of the South Metropolitan Company; and he was at work for the Company ten years or so before Sir George commenced his service. Singularly, the last words that Sir George wrote in the Company's "Co-Partnership Journal" were about John Durant.

The route taken by the *cortége* was across the Old Kent Road, Asylum Road, and Hollydale Road to the Nunhead Cemetery, which is within the gas supply district of the South Metropolitan Gas Company, and where the mother and father of Sir George are buried. Thus it will be seen there were two good reasons for choosing this as the burial-place of Sir George. Along the whole route, the footpaths were thickly lined by sympathetic people to numbers of whom the figure of him then passing to his final rest was well known. Throughout the route police were on duty to ensure a clear passage; and acknowledgment has to be made of their efficient and kindly performed service. Many shops and even public-houses had put signs of mourning to their windows; and numerous were the private houses with blinds closely drawn.

At the cemetery, the early visitor found a large portion of the cemetery, with the evergreen lined grave in the centre, kept perfectly clear, by a body of 500 gas workers—450 from the South Metropolitan works and 50 from the South Suburban works—under the command of Mr. W. D. Hunter, the Engineer of the Rotherhithe works. Anyone who was not invited, or who was not officially representing some body associated with the gas industry or the work of the deceased, would have found difficulty in getting past these guardians. An inner cordon kept clear a space near the grave. Standing a short distance from the head of the grave (which lies on the left-hand side of the main walk leading to the little church in the cemetery), one had a point of 'vantage. The morning had been dull; but as we stood there, the sun broke brightly through the gloom. Looking round beyond the reserved lines, it was seen that the general public were collecting by their thousands. A choir of 35 voices drawn from the various works were among the first to assemble within the enclosure. Then Mr. Walter T. Dunn was seen escorting the members of the Council of the Institution of Gas Engineers to a neighbouring place; and from thence fresh arrivals came thick and fast.

The institutions represented at the grave, with the repre-

sentatives who had signified their intention of being present, were :—

Council of the Institution of Gas Engineers—
Mr. Thos. Glover, of Norwich . . *President*
Mr. Jas. W. Helps, of Croydon . . *Vice-President*
Mr. Alex. Wilson, of Glasgow . . ,,
Mr. W. Doig Gibb, of Newcastle-on-Tyne . . . . . *Past-President*
Mr. S. Y. Shoubridge, of Sydenham. *Hon Secretary*
Mr. Thos. Berridge, of Leamington. *Otd. Member of Council*
Mr. John Bond, of Southport . . . ,,
Mr. F. T. Cotton, of Dublin . . . ,,
Mr. Joseph Davis, of Gravesend . . ,,
Mr. T. H. Duxbury, of South Shields ,,
Mr. Timothy Duxbury, of Oldham . ,,
Mr. L. Hislop, of Uddingston . . . ,,
Mr. R. G. Shadbolt, of Grantham . ,,
Mr. N. H. Humphrys, of Salisbury . *Dist. Member of Council*
(Representing Southern District Association.)
Mr. Jas. D. Smith, of Stirling . . . ,,
(Representing North British Association.)
Mr. W. Whatmough, of Heywood . ,,
(Representing Manchester District Association.)
Mr. Walter T. Dunn . . . . . *Secretary*

Institution of Civil Engineers—
Sir William Matthews . . . . . *President*
Sir Guildford Molesworth . . . *Past President*
Mr. Walter Hunter . . . . . *Member of Council*
Sir Alexander Binnie . . . . . ,,
Dr. J. H. T. Tudsbery . . . . . *Secretary*

The remainder of the members of Council had expressed their regret that various unavoidable circumstances unfortunately prevented them being present.

Eastern Counties Gas Managers' Association—
Mr. Joseph Davis . . . . . *Ex-President*

Manchester District Institution of Gas Engineers—
Mr. Tim. Duxbury . . . . . *President*
Mr. W. Whatmough . . . . . *Hon. Secretary*

Midland Gas Managers' Association—
Mr. Harold E. Copp . . . . . *President*
Mr. Charles Meiklejohn . . . . *Hon. Secretary*
Mr. J. Ferguson Bell.
[As will be seen from the names elsewhere, several other members of the Association were present.]

North British Association of Gas Managers—
Mr. Jas. D. Smith . . . . . *President*
Mr. L. Hislop . . . . . *Secretary*

North of England Gas Managers' Association—
Mr. T. H. Duxbury . . . . . *Vice-President*
Mr. W. Doig Gibb . . . . . *Past-President*

Southern District Association—
Mr. J. W. Helps . . . . . *Member of Committee*
Mr. G. R. Love . . . . . ,,
Mr. J. D. Ashworth . . . . . ,,
Mr. T. Berridge . . . . . ,,
Mr. S. Carpenter . . . . . ,,
Mr. J. Tysoe . . . . . ,,
Mr. W. E. Price . . . . . ,,
Mr. H. C. Head . . . . . ,,
Mr. Norton H. Humphrys . . . . *President*
Mr. A. F. Browne . . . . . *Hon. Secretary*
[As will be seen from the names elsewhere, several other members of the Association were present.]

We learn from Mr. James Whimster, J.P., and Mr. Octavius Thomas, Secretaries respectively of the Irish and Welsh Associations, that unfortunately, owing to time and distance, these Associations could not be represented.

Society of British Gas Industries (of which Sir George Livesey was the President at the time of his death)—
Mr. Charles Clare . . . . . *Chairman, Central Council*
Mr. John Mackay . . . . . *Member of Council*
Mr. Frank West (for Mr. Fred West) ,,
Mr. Arthur L. Griffith . . . . *Secretary*

Gas Companies' Protection Association—
Mr. H. E. Jones . . . . . *Chairman*

London Waterside Manufacturers' Association—
Mr. L. A. Martin (Messrs. Henry Tate and Sons, Limited) . . . . . *Chairman*
Mr. C. Taylor . . . . . *Secretary*

Gaslight and Coke Company—
Mr. Corbet Woodall . . . . . *Governor*
Mr. D. Milne Watson . . . . . *General Manager*
Mr. T. Goulden . . . . . *Chief Engineer*
Mr. H. Rayner . . . . . *Secretary*
Mr. A. Bevis . . . . . *Accountant*
Mr. F. W. Goodenough . . . . . *Chief Inspector*

Commercial Gas Company—
Mr. W. G. Bradshaw . . . . . *Chairman*
Mr. Walter Hunter . . . . . *Deputy-Chairman*
Mr. H. E. Jones . . . . . *Member of Board*
Mr. H. D. Ellis . . . . . *Secretary*
Mr. Stanley H. Jones . . . . . *Engineer*

The *National Temperance League* and the *United Kingdom Band of Hope Union* were also represented.

It is impossible to say, with such a multitude, whether or not other societies were represented, or even whether all the gentlemen named were there, or whether there were not others who should be mentioned had their presence been known. In such a concourse of people, one could only stand and take in the scene as far as vision permitted. But among others who were observed were Sir Henry Kimber, Mr. G. C. Trewby, Mr. W. R. Herring, Mr. Fletcher W. Stevenson, Mr. R. Bruce Anderson, Mr. C. E. Botley, Mr. A. E. Broadberry, Mr. T. May, jun., Mr. James Randall, Mr. H. O. Carr, Mr. J. H. Brown, Mr. C. W. Braine, Mr. A. G. Snelgrove, Mr. A. Canning-Williams, Mr. Thomas Duxbury, Mr. T. N. Ritson, Mr. Sugg-Wright, Mr. A. E. Podmore, Mr. T. C. Hersey, and Mr. S. Chandler. But memory refuses to be further taxed.

The church bell was tolling; and the clergy—Archdeacon Hodges, Canon Hodges (relatives of the deceased), and Canon Ransford (an old personal friend)—were seen wending their way down the main walk to the gates to receive the coffin and the great solemn procession. By side roads skirting the part of the cemetery fenced in by the gas workers, the procession passed to the church. The accommodation is limited; and but few could enter the sacred edifice, where the first part of the service was conducted. The thousands of men meantime filed into the reserved enclosure; and when they had taken their places, the scene was a singular one. There was a perfect sea of faces, with eyes all directed to one spot—a spot to which many who were there, and many who could not be there, will hereafter often be found directing their steps. A clear roadway had been kept between church and grave; and soon the clergy were seen issuing from the church followed by the coffin and the mourners—the children of the late Mr. Frank Livesey, the Directors (ordinary and workmen) of the two Gas Companies, the veteran Mr. Robert Morton among them, and the confidential friend, Mr. Frank Bush), Mr. Charles Carpenter, Mr. F. M'Leod, Mr. S. Y. Shoubridge, and Mr. Charles M. Ohren, together with the personal friends, Mr. Corbet Woodall, Mr. H. E. Jones, the venerable Mr. Thomas Newbigging, Mr. G. C. Trewby, Mr. William King, the heads of technical societies, and others who had occupied the carriages. Gathered round the grave with the coffin resting at the side, the beautiful hymn "Peace, Perfect Peace," was sung; and as the final words

And Jesus calls us to Heav'n's perfect peace

rang through the air, Canon Ransford's clear voice was heard saying—"Man that is born of a woman hath but a short time to live." The service proceeded; the body was placed in its tomb. Then Canon Ransford, standing over the grave, and speaking so that his voice reached nearly to the fringe of the vast multitude, said:

It is seldom good to add anything to the words of our beautiful burial service. But this is no common occasion. A prince has fallen in our Israel. This gathering is one of a very notable kind. What is it, I ask, that brings so many men together on a fine Saturday afternoon in one of the busiest parts of this great Metropolis? There are other gatherings of thousands to-day; but I take it there is no gathering of thousands of men of the kind that we have here, and for such a purpose. You have gathered here out of a burning desire to show your love and respect for him whose body we have now committed to the grave. That desire has brought me 700 miles; and I count it little, so great is my respect for George Livesey. I have known him for 39 years; and all the while as an upright, unselfish, able man—one of God's noblemen, and an earnest and devout Christian. He dated—he has told me the story more than once—the earnestness of his purpose in life from his confirmation day. He had made an appointment to spend the afternoon in the company of a friend in some fun—fun harmless enough, but still fun. Deeply moved by the confirmation service, he perceived that life was a serious

thing, and when he went to the place of appointment and saw his friend coming to meet him, he shouted "I am not coming to-day," and turned and ran swiftly home. He said "No" that day to the temptation to do what would have robbed him of some of the convictions newly sown in his heart and mind. To say "No" is what some men find it so very hard to say. It was what George Livesey ever said, so far as I knew him, when tempted to do anything wrong.

When I was the minister of the Church of St. Jude's, at Brixton, he was ever helpful to me. I could rely upon him to the utmost. He never, the whole of his life, gave less than the tenth part of his income, even when his income was small, to Christ's work. Afterwards, he gave much more. Part of what he did is known to you, but not all. You know how generous he was with the money God gave him. More than one Institution in South London owes its inception to him. You know how much he gave to the cause of temperance, which was a cause so dear to him. There was much more, of which no one knew. Through my hands he gave tens of thousands of pounds anonymously—it was a condition that his name was not to be known—to the prosecution of Christ's Kingdom and Christ's glory. Not only did he give money, but he gave time and the energy of his great mind. He was superintendent of my Sunday School for ten years, and always helpful in every possible way.

I know also, and possibly you know equally well, if not better, on what lines he worked in his ordinary calling—how inflexibly just he was; how invariably upright. You remember those dark, distressful times of 1889 when he went and fought so grand a fight. He fought then in your interests, and he fought as for his own. He was empty of self; he fought for his fellow men, and you know it. I well remember when things were at their worst, how he was carrying his life in his hands. She, who is now his widow—and for whom our prayers go up that she may be abundantly comforted—has told me something of the nature of the threats that he received; but she knew not all. The fact is he fought that battle on his knees. All through he did what he felt was right; and he came out victorious, because God was with him. The success of the great scheme that he inaugurated—a scheme that is as dear to you to-day as it was to him—you may thank God for; for the success of that scheme is due to God's blessing on it. To-day this gathering, and the love and reverence you feel for him vindicate his great purpose.

Honoured by his Sovereign, he was the wearer of greater honour than that. More than any earthly honour, is the honour of the love and esteem of you thousands of men, who feel you have lost a friend of the first kind. I say to you over his grave,

LET THE MOVEMENT HE BEGAN BE CONTINUED ON THE LINES WHICH HE LAID DOWN.

I notice on one side and another that its furtherance and development have opened. I notice Sir Christopher Furness, a large employer of labour in the North, suggesting that some of the principles, which to you are common and well known, should be introduced into the great firm of which he is the head. Let that kind of thing go on; and there will be a monument of an imperishable kind raised to the honour of our dear friend.

I shall not say we leave him in the grave. His soul is with Christ who redeemed him, with Christ whom he served, with Christ whose example he ever strove to follow, with Christ with whose spirit he was filled. You and I are the better for having known him. He asked for grace to follow his example; and we hope by the love of Christ, our Lord and Saviour, we shall share with him that glory upon which he has now entered.

Printed copies of the hymns sung had been distributed; and Canon Ransford announced the second one; and immediately the beautiful words, from thousands of hearts through voices, were winged over the grave, wafted between trees and monuments, and away into limitless space—

Now the labourer's task is o'er;
Now the battle day is past;
Now upon the farther shore
Lands the voyager at last.
Father, in Thy gracious keeping,
Leave we now Thy servant sleeping.

Soon after the benediction was pronounced; and then the chief mourners took one final look into the sepulchre of him they loved. For long afterwards, too, the men and many of their wives in turn also looked upon that which contained the body of him in whose heart they had held a large place, who had been their friend and defender, who had bequeathed them all a legacy of brilliant example, and who had left them, through his noble exertions and self-sacrifice, in far better condition than he had found them. They had loved to hear his voice; the human voice is for ever still. But many are the encouraging and kindly words he has uttered that will live and be cherished throughout numerous lives.

Among the senders of the floral tokens of affection, sympathy, and regard that lined the walls of the last resting-place upon earth, and that accompanied deceased to the grave, were:—

1. Lady Livesey
2. Mrs. Livesey, the Misses Livesey, Messrs. Frank and George Livesey
3. Mrs. Ludwig Borsdoff (with the Misses Eva and Florence Livesey)
4. Annie and Ambrose
5. Servants, "Shagbrook," Reigate
6. Outside Servants, "Shagbrook," Reigate
7. Mr. and Mrs. Hewes Keddell
8. Mr. and Mrs. R. Morton and family
9. Mr. Frank Bush
10. The Directors of the South Metropolitan Gas Company
11. The Directors of the South Suburban Gas Company
12. The Governor and Directors of the Gaslight and Coke Company.
13. The Directors of the Commercial Gas Company
14. The Directors of the Wandsworth and Putney Gas Company
15. Mr. F. M'Leod
16. Mr. and Mrs. Carpenter
17. Sir John Aird
18. Canon Hodges
19. Mr. Charles Hunt
20. Sir F. and Lady Flannery
21. Mr. and Mrs. Jabez Light
22. Mr. John Boraston
23. Mr. Geo. Howlett
24. Mr. Corbet Woodall
25. Miss Gertrude Woodall
26. Mr. Henry Woodall
27. Mr. Harold Woodall
28. Mr. and Mrs. G. C. Trewby and Miss Trewby
29. Mr. Lawrence Rostron and Mrs. Simpson Rostron
30. Mrs. J. Moncrieff Dick
31. Mr. and Mrs. Docwra
32. Mr. Waite and Mr. Grearly
33. Henry, Ena, Hilda, and Brenda Taylor
34. Mr. William Banford
35. Messrs. Hicklin, Washington, and Pasmore
36. Mrs. William Sugg
37. Officers of the South Metropolitan Gas Company
38. Officers of the South Suburban Gas Company
39. Clerks and Meter Readers of the South Metropolitan Gas Company
40. Works Department, Old Kent Road
41. Yardmen, Old Kent Road
42. Carbonizing men, "
43. District men, South Metropolitan Gas Company
44. Slot Meter Collectors, South Metropolitan Gas Company
45. Lighting Department, South Metropolitan Gas Company
46. Pensioners of the South Metropolitan Gas Co.
47. Messengers, Old Kent Road
48. Kitchen Staff, " "
49. Widows of Deceased Workmen, South Metropolitan Gas Company
50. Athletic Club, Old Kent Road
51. East Greenwich Officers and Workmen
52. Vauxhall Workmen
53. Rotherhithe Workmen
54. Rotherhithe Office Staff and Foremen
55. Workmen, Foremen, and Officers, West Greenwich Station
56. Bankside Co-Partners
56A. Coal Jetty, Surrey Docks
57. Clapham Show-Room
58. Woolwich Show-Room
59. Ordnance Wharf Staff
60. Workmen, South Suburban Gas Company
61. Mr. J. F. Braidwood
62. Mr. and Mrs. A. F. Browne
63. Mr. J. Tysoe
64. Mr. S. S. Field
65. Mr. and Mrs. W. D. Hunter
66. Mr. H. C. Sims
67. Mr. P. J. Richardson
68. Mr. G. C. Parnaby
68A. Mr. Geo. Drumgold
68B. Mr. T. J. Blackmore
68C. Alfred and Evelyn Howard
69. Mr. A Hewes
70. Mr. H. Talbot
71. Mr. and Mrs. Fox
72. Mr. S. Beal
73. Institution of Gas Engineers
74. Southern District Gas Engineers and Managers
75. London and Southern District Junior Gas Association
76. Midland Association of Gas Managers
77. President and Executive Council of the Shipping Federation
78. Coal Consumers' Defence League
79. North of England Gas Managers' Association
80. The Gas Companies' Protection Association
81. Working Men's Total Abstinence Society (Caroline Street)
82. The Committee of the Nunhead Band of Hope
83. The Directors of the London and South-Western Bank
84. South Metropolitan Electric Light Company
85. Editor and Staff of the "Journal of Gas Lighting"
86. Wm. Sugg and Co., Ltd.
87. Messrs. M'Corquodale and Co.
88. James Russell and Sons
89. R. W. Cooper and Sons
90. Directors of Messrs. Willey and Co.
91. Mr. Frank Keep

A DESERVED ACKNOWLEDGMENT.

Such a great and impressive procession and ceremony as that of Saturday—it will have occurred to many who were present, and likewise to many readers of the foregoing account—must have had in its organization some central head and hand. We are only echoing what is felt by all—Directors, officers, men, and friends—when we say that they are deeply indebted to Mr. Charles Carpenter for what he did in this regard; and that there was not a single hitch, is due in very great measure to the careful and devoted manner in which he carried out the details. He will have counted the work as nothing more than love and duty demanded of him; but nevertheless others cannot help feeling their indebtedness.

Nor must the valuable assistance of Mr. F. M'Leod (Mr. Frank Bush's successor in the Secretaryship of the South Metropolitan Company) be overlooked; and, beyond, it is impossible to value too highly the services of the entire staff, who rendered willing and hearty help to their respected Chief Engineer and the Secretary.

Sunday Visitors to the Cemetery.

On Sunday afternoon, there was a further remarkable sight. Visiting the cemetery, a *queue* of people was found stretching almost from the church to the main gates; and as they moved forward, the end of the line was constantly supplemented by fresh comers. This had been going on more or less the whole time the cemetery had been opened; but in a continuous and close stream from 2.30. So it went on until closing time. Investigation showed that just beyond Sir George Livesey's grave, on vacant ground close to the church, the floral tokens of affection and sympathy had been placed, and were being guarded by members of the South Metropolitan staff and workmen; and along paths between the wreaths the people were allowed to pass. On the way to the ground, the grave had to be passed. A heavy stone slab had been temporarily placed over the top; and all in the moving line turned their eyes to the sacred place. It was noticeable that most of the men were accompanied by wives, daughters, or sweethearts; and judging from the black neck-ties of the men and the tokens of mourning on dresses—a small bow in many cases—it was easy to conclude that the workers were bringing those near and dear to them in their private life to see something of the honour that had been done him whom they revered, and had loved and esteemed it a privilege to call master and friend. A greater crown of honour could no man have than this spontaneous exhibition of affection.

SIR GEORGE LIVESEY:

ENGINEER, ADMINISTRATOR, AND PARLIAMENTARY WORKER.

By Charles Hunt.

There has passed away in the person of Sir George Livesey one who has left his impress for all time on the gas industry, whether his achievements be regarded from an engineering or from a commercial or social or administrative standpoint. We who are spared for a time to carry on as best we may the work to which his life was devoted, will find in a contemplation of that work both encouragement and guidance. "What would Sir George Livesey have done" is a question that will be often asked in the days that are to come; and the answer to it will as surely be found in a record of his achievements as though he had left behind him a volume of precepts.

There can be no gainsaying the fact that Sir George Livesey owed his wonderful success primarily to that force of character which impelled him to overcome all obstacles, however formidable they might appear. Thus we find him successively, Engineer, Engineer and Secretary, and finally in the highest position of all—that of Chairman of his Company. As, however, a highly valued friend has just written me, "his personality would have been amazing had it been less kindly enforced." But this very remarkable record could hardly have been achieved by force of character alone. There must have been—and there was—a backing of engineering and administrative ability of the highest order, such as is rarely to be found combined in one person, but which alone does not invariably command the highest success. Sir George possessed both the will and the power to succeed; and it was this fortunate combination that brought him to the very foremost position in his profession at a comparatively early age.

As an Engineer, Sir George Livesey was always a rigid economist, and objected to anything in the nature of show or ornament. In his constructional work no superfluous material was used if he could help it. For example, no such things as finials to gasholder columns or standards met with his approval, holding, as he did, that the real adornment of a gasholder framing lay in the fitness of its design for the purpose it had to serve. This idea carried him, as will be seen, to perhaps the most important of all his engineering achievements. To the very last also he looked askance at rubbed and gauged arches as unnecessary for a retort-house. If, however, there were no imposing buildings to greet the eye of visitors, there were matters of much greater importance to be seen, which made the Old Kent Road works almost a generation ago a very Mecca to gas engineers from all parts of the world. To mention only a few of these. Here were first used on an extensive scale concrete as a substitute for brickwork, and cement rendering in place of puddle backing in the construction of gasholder tanks; and Sir George's experience as a pioneer in this direction was freely placed at the service of his brother engineers. It will be recollected, too, that he, in conjunction with the late Mr. F. C. Hills, was the first to experiment, upon a working scale, on the use of ammonia for purifying coal gas; the process carried out at Old Kent Road forming the basis of the more ambitious one which was subsequently devised by the late Mr. Claus, the sole, though important, outcome of which was the establishment of the Claus kiln, now extensively used for recovering sulphur in the solid form. Sir George's experiments with ammoniacal liquor as a purifying agent resulted in the invention by him of the Livesey washer, now so well known in almost every gas-works.

Sir George was never a convert to the German system of regenerative firing for heating gas-retorts; for he believed that similar results could be obtained by following simpler methods of construction. As a matter of course, nothing but advantage could possibly result from independent investigation of a matter so important; and the present day South Metropolitan setting of ten retorts in two vertical rows, which may be regarded as the outcome of such investigation, would be hard to beat for economy of fuel and ground space. Similarly, Sir George objected to the use of carburetted water gas; and it must be admitted that for some years the working results of the South Metropolitan Company, when compared with those of other companies similarly situated but using carburetted water gas, justified his adhesion to coal gas.

It is, however, for his work in connection with the development of the gasholder that Sir George will be chiefly remembered as an Engineer. Prior to the construction of his world-famous holder in the late seventies, the way had been to a great extent cleared by Mr. Corbet Woodall's endorsement, on a fairly large scale, of the practicability of the abolition of roof trusses, which many years previously had been demonstrated by Croll; while as regards the guide-framing, engineers had for a considerable time been unsettled in their faith in the old massive cast-iron column, without having learned the most economical method of using wrought iron as a substitute. It remained for Sir George Livesey to teach us this; and in doing so he—if I may be allowed to quote from my address to the Midland Association of Gas Managers in 1902—"leapt at one bound to the position of foremost gasholder constructor of his time." The extremely light construction of the guide-framing of the five million gasholder at Old Kent Road was universally regarded as a daring innovation to be followed—if at all—at a distance; but some years later it was eclipsed by a 12 million one at East Greenwich, in the construction of which the resourcefulness of the Engineer was abundantly manifested. Finding that there would be considerable difficulty and expense in sinking for the tank to the intended depth, owing to the abundance of water, he decided to reduce the depth of the tank, and increase the number of lifts in the gasholder. This gasholder has consequently six lifts, each 30 feet deep—the only one in existence (so far as is recollected) having this number of lifts. Two of these lifts rise above the guide-framing—a system of construction which had been previously introduced by the Engineer in connection with smaller-sized gasholders.

Although striving by every means to keep down capital expenditure, Sir George never hesitated to incur any outlay which appeared to be desirable, or which promised to prove remunerative. With him the regulation of such matters was but a means to an end—that end being to supply gas at the lowest possible cost. Thus it vexed him for years to be compelled to spend money upon purification which he felt to be entirely wasted, and but for which the price of gas could have been reduced to the consumers. It need not be repeated here how long and earnestly, and with what good effect at last, he laboured for the repeal of the sulphur restrictions. He was very quick to perceive the possibilities of the prepayment-meter system; and to-day two-thirds of the meters in use by the South Metropolitan Company are of this kind. Similarly, he recognized the importance to the gas industry of the invention of the incandescent mantle, and not only strove to introduce this system of lighting as much as possible among the consumers, but also did his best to secure a cheap supply of mantles. His successful negotiations with the Welsbach Company may be called to mind in this connection; and with a similar end in view—namely, the prevention of a corner in the supply of monazite sand—the South Metropolitan Company, acting under his advice, acquired a few years ago a deposit of this material in South Carolina.

With the introduction of incandescent gas lighting, it became apparent to Sir George that the day of high illuminating power was over; and he at once rose to the occasion by promoting a Bill to empower the South Metropolitan Company to reduce their standard of illuminating power from 16 to 14 candles. This gave rise to one of the most interesting parliamentary contests of recent times, in the course of which the transparent sincerity of Sir George—always conspicuous, but never more so than when he was giving evidence before a Parliamentary Committee—prevailed with the Committee who considered the Bill, in spite of the most strenuous opposition from the London County Council. He was, in fact, asked by the Chairman why he did not propose to reduce the illuminating power below 14 candles—an idea which was afterwards improved upon by Sir John Brunner, who suggested the desirability of a reduction to eight candles when considering a Bill promoted by the South Suburban Company a few years later.

One of the provisions of the South Metropolitan Company's Act of 1900 related to the method of testing—it being enacted that the gas under test, instead of being burnt at a fixed rate of 5 cubic feet per hour, was to be burnt at such a rate as to give a fixed illumination of 16 candles. This method was subsequently challenged; and it was upset by the Gas Referees, acting under the powers conferred upon them by the Commercial Gas Act a year or two later. Consequent upon this, a Departmental Committee was, with the concurrence of the Metropolitan Gas Companies, appointed by the Board of Trade to inquire into the method of testing, and also into the necessity, or otherwise, of a continuance of the sulphur restrictions. The events that followed (in all of which Sir George took a foremost part) must be still fresh in the minds of your readers. Suffice it to say that, but for Sir George's indomitable will, superb temper, and undaunted courage, the gas industry might still have been smarting under the needless infliction of the sulphur restrictions, and there would not have been any Carpenter burner. The splendid services rendered by him in connection with these two matters alone ought never to be forgotten, and entitle him to the highest niche in our Temple of Fame.

All this, again, was but a means to an end—namely, the cheapening of the cost of production, so as to enable the price to be reduced to the consumer. How greatly he deprecated the action of colliery owners in unduly raising the price of coal need not be told here. In all that he said and did in this connection, he was actuated by the sole consideration of what was best for the great gas industry and other industries of the country, including that of the colliery owners themselves—in which matters, and particularly in the reduction of illuminating power, we can but follow where he led the way. There can be no rest until our processes of manufacture are made adaptable to the production of low-grade gas such as he had in contemplation, and such as has already become an actuality in other countries.

Sir George Livesey was "the hero of a hundred fights," in Parliament and elsewhere; and it was my good fortune to witness many of these. He never, however, engaged in any in which he did not believe the cause to be good; and on at least one occasion which came under my notice, he refused to give evidence for a company in support of an initial price which he considered too high. It is not surprising, therefore, that his influence before Parliamentary Committees should be unique; and that even when their decisions were adverse, owing it might be to some question of procedure or precedent, individual expressions of sympathy with his aims and objects were by no means unfrequent. A leading Parliamentary Agent said to an influential client in my hearing, "Why do you not get Livesey on your side? He is the strongest man in London."

The qualities which gave Sir George Livesey such a unique position before Parliamentary Committees served him in equally good stead as an administrator. His temper was superb; and he rarely, if ever, said a rough word. He was naturally of a most kindly disposition; but his self-control was also perfect. I never saw him ruffled but once, and then but for a moment. This was when he flared up indignantly at an insinuation of Counsel, who got, moreover, as much as he gave. On this subject he once remarked to me, in the course of conversation, that he always endeavoured to keep his temper whatever might be the provocation, because when a man loses it he gives himself away. He was always more ready to praise than to blame; and praise from him was felt to be praise indeed. At general meetings of shareholders he always reserved for himself to propose the vote of thanks to the officers, in allotting which he was always mindful of the fact that, however valuable other officers may be, the technical head of a gas undertaking is its life and soul. In the Board Room he ruled, as he did elsewhere; but it was over willing subjects, for he never claimed a monopoly, either of speech or opinion. To quote once more from my friend's letter, "We followed because we loved, and never thought of his authority." In all his actions he was just, slow to anger, and of great kindness.

To the public Sir George Livesey was best known as the champion of cheap gas, as the originator of the sliding-scale of dividend and the co-partnership system, and as having successfully combated the pretensions of the Trade Unions in the memorable strike of the gas workers in 1889. This remarkable public record indicates statesmanship of the very highest order. By his advocacy of the sliding-scale, and the consequent adoption of this by nearly all the leading gas companies, he put an end once and for all to the periodical agitation to which the London Companies in particular had previously been subject, to the great detriment of all interests concerned; and it has answered its purpose admirably—dealing justice alike to shareholders and gas consumers. By the defeat of the gas workers' strike, the Trade Unions received a blow to their pretensions from which they have never recovered; and the way was left open for permanent industrial peace through the operation of the profit sharing—subsequently the co-partnership—system. How well this has succeeded is known to all; and it is a melancholy satisfaction that Sir George was permitted to witness the increasing appreciation in which it is held, as evidenced by its recent adoption by many important gas undertakings. In this matter, Sir George was undoubtedly actuated by an intention to be master in his own house. But it is characteristic of him that he hit upon a scheme for effecting this which is the charter of emancipation for the gas worker, who, instead of living from hand to mouth, has now something to look forward to as a provision against old age or sickness, independently of what he may be entitled to receive from superannuation or other funds. In formulating this scheme, Sir George attached great importance to the teachings of Mazzini, the great Italian patriot, from whom he frequently quoted when speaking on the subject; but he was influenced entirely by the Scriptural injunction "Do unto others as ye would they should do unto you." That was his guiding principle through life. May this also be said of us, when Time, for us, shall be no more.

WORK AS A GAS REFORMER.

In glancing at the work of the late Sir George Livesey as a reformer of the legislation affecting the gas industry, probably the most conspicuous features of it are the proposal which led to the introduction of the sliding-scale, and his more recent work in connection with the inquiry into the powers of charge of the London Gas Companies which took place in 1899, and with the movement which resulted in the repeal of the sulphur restrictions and the alteration of the illuminating power and method of testing gas. The latter events will be fresh in the recollection of our readers; but with the circumstances attending the adoption of what has now become the almost universal system of selling gas they will probably be less familiar.

It is now rather more than thirty-four years ago that the proposal for a more general adoption of the sliding-scale, under which the shareholders' dividends rose or fell with the price of gas, was put forward. We say "more general," because the principle had been embodied in two Gas Acts passed a few years previously. The Sheffield Gas Act of 1866, and the West Ham Gas Act passed three years later, contained clauses varying the rate of dividend according to the price charged. It was in 1874, however, that Sir George (then Mr.) Livesey, in his Inaugural Address as President of the British Association of Gas Managers, laid before his professional colleagues his views on the subject. In dealing with recent legislation affecting gas companies, he said the system inaugurated thereby fostered the idea that, come what might, gas companies were to be protected, and, under any circumstances, were to be guaranteed their full dividends. He assured his hearers that he did not wish to say one word against the companies—either that the capital expenditure had been excessive, or the management expenses extravagant. All he said was that the then existing system was a direct incentive in this direction, and that it took away all motive or encouragement to economize, and might thus in the end be productive of great injury to all concerned. In his opinion, it was precisely in the opposite direction that the law regulating gas companies should act. It ought to be possible to frame a scheme, to be embodied in a General Act, that should cause the interests of gas companies and their customers to run side by side—to make the consumers, in a sense, partners in the gas company, whereby both should participate in any improved or more economical working. The companies should have a slightly increased dividend for every reduction in price below a certain minimum standard; and, to be perfectly fair, they would have to submit to a reduction if their price exceeded a maximum limit. He added that there were several plans whereby this object might be attained; and he held it to be most strongly to the interests of all gas shareholders, directors, and managers to heartily assist in carrying out some system by which they might have their customers with them—"some easily workable self-acting arrangement that would put an end to the cat-and-dog life, and make them live and work in peace with each other; in fact, make it really to the interests of gas companies and gas managers to do the best they can for the consumers."

In commenting upon these remarks, which, as the President fairly acknowledged, were liable to be misunderstood, we agreed that, his own Company occupying an exceptionally favourable position, they might be thought by some to be invidious, when they were really made in the best possible spirit. We pointed out that the rights of gas companies had no stouter champion than Mr. Livesey. But he had the courage to say that gas companies had duties; and if, at the moment, he seemed to fall in with popular clamour, it was only because, for his purpose, it could not be avoided. The principle advocated by him—viz., an increased dividend for every reduction, and a reduced dividend for every increase, in price beyond a certain standard—was embodied in a Bill promoted the following year by the Corporation of London and the Metropolitan Board of Works. The Bill was referred to a Select Committee, presided over by Mr. W. E. Forster, to whom the views of the Board of Trade on the matter were conveyed in a long letter. The Board set forth clearly the conditions which appeared to them to be necessary to make a scheme of a sliding-scale of price and dividend just and effectual. They considered that the initial price and quality of gas should be fairly fixed, having regard both to the immediate existing interests of the companies and the consumers, and to the prospects of both under the new system; also that the price and dividend should vary in certain fixed proportions without limit. In the Bill, the price of gas was not to exceed 3s. 9d. per 1000 cubic feet. In obedience to a Speaker's Order, Mr. Livesey gave evidence before the Committee—not, however, in favour of the proposal in the Bill, but in support of the suggestion of the Board of Trade. In the result, the Committee put before the promoters the advisability of accepting the suggestion. After deliberation,

they decided to do so; and it was embodied in a clause fixing the standard price at 3s. 9d., with an increased or reduced dividend of 5s. per cent. according as the price was lowered or raised. The clause was eventually passed; but it was objected to by all the Companies except the Commercial and Ratcliff, who were in Parliament with an Amalgamation Bill. This was passed with the sliding-scale, starting with a standard price of 3s. 9d., in it.

Curiously enough, the Directors of the South Metropolitan Gas Company were divided on the question of the adoption of the sliding-scale—three being in favour and two against it; and their official was stigmatized by a prominent member of the Parliamentary Bar, since deceased, as a "traitor" for proposing it. However, next year the Gaslight and Coke Company accepted it as a condition of obtaining the sanction of the Board of Trade to their amalgamation with the Imperial Gas Company. A Bill was promoted by them in 1876, containing not only this new feature but another—viz., the now familiar auction clauses. The same year the South Metropolitan Company promoted a Bill to obtain authority to amalgamate with any Metropolitan Gas Company south of the Thames, and adopt the sliding-scale regulations contained in the Bills of the Commercial and the Gaslight and Coke Companies. The Bill was passed with a standard price of 3s. 6d. (3s. 3d. having been demanded by the Metropolitan Board of Works and the Lambeth and Camberwell Vestries); the Company then selling 16-candle gas at 3s. The sliding-scale system, as is well known, has since been extended to all the Metropolitan Gas Companies as well as to a large number of those in the Provinces. As to its working, reference may be made to a most interesting chapter in Mr. L. W. S. Rostron's "Powers of Charge of the Metropolitan Gas Companies," for which the late Sir George Livesey wrote an instructive preface.

The idea of selling gas according to a sliding-scale did not originate with Sir George Livesey, nor do we remember that he ever claimed that it did. The principle was, as already mentioned, embodied in the Sheffield and West Ham Gas Acts; and he acknowledged, in a letter which appeared in our columns rather more than a year ago, that they might have given him the idea. What he did claim, however—and we think justly—was that he was the originator of the application of the "up-and-down complete sliding-scale to gas companies." In the course of the letter he said in reference to it: "The controllers of the gas industry almost universally ridiculed my proposal that dividends should be allowed to rise above 10 per cent. as the price of gas was reduced. They said Parliament would never listen to it; and that even if Parliament agreed, so soon as any gas company increased their dividend above 10 per cent. there would be another public outcry and agitation of the kind that in those days had become chronic. Instead of that came reduced prices, increased dividends, and—best of all—a lasting peace."

In the same letter, Sir George related the circumstances under which the auction clauses came to be introduced. They were not mentioned—probably they were not even thought of—before Mr. Forster's Committee. But possibly the proceedings before that Committee led the then Secretary to the Board of Trade—Mr. (afterwards Lord) Farrer—who was their author, to introduce them. He did so, as previously mentioned, in the Gaslight and Coke and South Metropolitan Companies' Bills of 1876; and in 1877 he induced Parliament to adopt them as a Standing Order. Mr. Farrer said that henceforth gas shareholders should not have allotments of new gas capital at par, whereby they obtained high premiums for doing nothing, to the disadvantage of the public. The late Mr. Charles H. Parkes, the Board of Trade Official Auditor of the London Gas Companies' accounts, told Sir George that he had never liked the sliding-scale until Mr. Farrer proposed the auction clauses. "Then," said Mr. Parkes, "the auction clauses are the proper complement to the sliding-scale; and the two together have my full approval." "Thus combined," wrote Sir George, "they have made gas shareholders and consumers partners—the only really satisfactory settlement of the problem of the supply of public utilities (which must be monopolies, whether they are in the hands of companies or corporations); the advantages of both monopoly and competition being thereby secured. They have given consumers cheaper gas and shareholders higher dividends (upwards of £3,000,000 extra in London alone, according to Mr. Haward, of the London County Council); they have saved London at least from a municipal supply of gas; they have provided a safe investment, at a fairly good rate of interest, for the savings of the thrifty; and they have helped more than anything else to bring peace to the gas industry."

The effect of the adoption of the sliding-scale was to secure peace, as its introducer intended; but in course of time disturbing circumstances arose. Towards the close of the year 1898, the Gaslight and Coke Company gave notice of their intention to introduce a Bill the following session to raise additional capital to the extent of £3,500,000 by the issue of debentures. The Company were unpopular at the time, in consequence of the high price of their gas on the north side of the Thames compared with that charged on the south; and considerable agitation was the consequence. The outcome of it all was that quite early in the session of 1899, Mr. Cohen, the Member for East Islington, moved (as a sequel to a similar motion made in the preceding session) for the appointment of a Select Committee to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and report as to the method in which these powers had been exercised, having regard to the differences of price charged by the various Companies. The debate on the motion having been adjourned, Mr. Pickersgill next day gave notice of an amendment, to add at the end of the motion, "and also whether the provisions of the Acts fixing the price of gas supplied and the rate of dividend should be considered." The Committee commenced sitting, under Sir James Rankin, on the 20th of April, when Sir Courtenay Boyle, K.C.B., the Permanent Secretary to the Board of Trade, gave evidence. Sir George Livesey appeared before the Committee on the 9th and 13th of June, and expressed in no uncertain way his views as to the reason of the price of gas being so much higher on the north than on the south of the Thames. His evidence bore out his consistent impeachment of the management of the great undertaking controlled in the Horseferry Road; and it gave the officials something to answer. The Secretary and General Manager (Mr. John W. Field) had a long and trying examination; and he received the thanks of the Chairman for the patience he had exhibited under it. The Committee issued their report towards the close of July. It amounted to a verdict that the excessively high price of gas in North London was in consequence of over-capitalization and want of "due care and management" in the administration of the affairs of the Company supplying it. Happily, a greatly improved condition of things exists under the supervision of the present Governor, Mr. Corbet Woodall. For the rest, the Committee did not favour any project for transferring the gas supply of London to a public authority, or for any radical alteration of the generally accepted principles of gas legislation. On the contrary, they approved of the sliding-scale and auction clauses as constituting an excellent arrangement for all parties, which should be maintained; but they considered the standard price for London was too high, and should be reduced to 3s. 3d. Thus ended an important inquiry, a salient feature of which was the recognition by the Committee of the point that the intention of the sliding-scale was to give the consumers a special interest in the economical administration of a gas company, upon whom there was an implied obligation to conduct their undertaking, the control of which was left entirely in their hands, with "due care and management."

We now come to the third of the subjects referred to in the opening paragraph of this article—viz., the removal of the sulphur restrictions. It will probably be remembered that early in 1904 the then President of the Board of Trade (the Right Hon. Gerald W. Balfour, M.P.) appointed a Committee, consisting of Lord Rayleigh, F.R.S. (the Chief Gas Examiner for the Metropolis), Sir William Abney, F.R.S., Dr. Farquharson, M.P., Mr. John Fletcher Moulton, K.C., M.P., and Mr. William King, of Liverpool, to "inquire into and report as to the statutory requirements relating to the illuminating power and purity of the gas supplied by the Metropolitan Gas Companies, and as to the methods adopted for testing the same, and whether any alteration is desirable in such requirements or methods; and, if so, whether consequential alteration should be made in the standard price of gas." The appointment of this Committee was not the outcome, as was made clear in our columns at the time, of any so-called "gas agitation," such as that which produced the Powers of Charge Committee. There were no "sides" left to them; and consequently there was no Gas Companies' policy at stake. There was all the more reason to hope, therefore, that the outcome of the inquiry might be in accordance with established facts, and that the Committee's recommendations would be both acceptable to the Companies and agreeable to the best interests of the population of the Metropolis. Lord Rayleigh was the Chairman of the Committee, who held their first sitting on the 4th of February; and Sir George Livesey gave evidence on the 14th and 15th of March. In connection with it, an important statement was presented of results of experiments which had been carried out by Mr. Otto Hehner and Dr. Samuel Rideal, at the instance and at the cost of the South Metropolitan Gas Company, on the vitiation of air by sulphur compounds. These gentlemen reported that the amount of sulphur found when burning different kinds and quantities of gas in an ordinary small room varied from one-sixth to one-twentieth of the quantity actually introduced. Under ordinary conditions, not only was there no increase in the sulphur content of the air of the room over that in the outside air, but even a decrease, "owing to the rapid purification by the walls and ceiling." Both Mr. Hehner and Dr. Rideal were examined by the Committee, who decided to visit the South Metropolitan Gas-Works to witness the experiments. This evidence did a great deal towards "laying the sulphur bogey." We need not go into any further particulars, but merely add that the Committee made their report on the 19th of May, and it was presented to Parliament by the Board of Trade on the 7th of the following month. It contained eleven most important recommendations; but, so far as the subject now under consideration is concerned, only one need be quoted. It was as follows:—

> That the obligation placed upon the Companies with regard to the removal of the sulphur impurities (other than sulphuretted hydrogen) should be abolished, but that testing for information only should continue to be made in such manner and to such extent as may be prescribed by the Gas Referees.

At the meeting of the Institution of Gas Engineers, under the presidency of Mr. H. E. Jones, in the week in which the report was presented, Sir George Livesey gave the members a summary of the Committee's recommendations, and, with one exception, they met with a strong expression of disapproval. That exception was the recommendation quoted above, by which, as Sir George said, they had "got rid of the sulphur bugbear." This was a matter for which he had been struggling for forty years, and had

never missed a chance of pressing his point. It was worth a great deal that his object had at length been accomplished.

One of the earliest effects of the Committee's recommendation was the decision by the Wandsworth Borough Council not to test for sulphur impurities the gas supplied by the Wandsworth and Putney Gas Company. This gratifying result was achieved by the diplomacy of Mr. Jones, the Chairman of the Company; and it was characterized by Sir George Livesey as "a feather in his cap." It was, however, only individual action. The first indication of a concerted movement in the direction of obtaining general relief from the sulphur restrictions was witnessed at the meeting of the Gas Companies' Protection Association in October, 1905. Mr. Jones occupied the chair, and opened his remarks, in moving the adoption of the report and accounts, by referring to the gratification the members all felt at seeing Sir George Livesey (the Vice-President) again with them strong and hearty, after his serious illness towards the close of the previous year. He said it was not in vain that Sir George had risen from his bed of sickness, because they owed to him the pioneer movement towards having the "bogey of sulphur impurity well hustled, heckled, examined, and pecked at, until it was shown in all its nakedness before a Committee of the highest scientific attainment, of which one member of their own Committee (Mr. William King) was a member." They were all indebted to Sir George's courage, perseverance, and expenditure for demonstrating the absurdity of the penalizing to which gas companies were subjected; and those who knew what this meant had no sentiment but of gratitude in remembering that, for all time, the heavy yoke had been lifted from their necks by him. Sir George thanked the Chairman for his remarks, and threw out a suggestion that the Association should promote a Bill to relieve all gas companies who were under the sulphur restrictions. Subsequently, a number of Companies agreed to join in its promotion; and in due course the usual statutory notice was given, and the Bill deposited. Of course, it encountered opposition from certain local authorities; though the Wandsworth Borough Council declined to join them. The Bill was referred to a Committee presided over by Mr. F. Cawley, and among the witnesses in support of it was Sir George Livesey, who told them that, in the public interest, he regarded sulphur restrictions as totally useless. In the end, the Committee unanimously passed the preamble of the Bill, which subsequently received the Royal Assent. The result of this action on the part of the Association, on the initiative of its lamented Vice-President, has been the freedom of a number of other companies from the "yoke" to which the Chairman referred in his speech—a second Bill having been passed last year. At the annual meeting of the Association in October, Mr. Jones expressed the opinion that the passing of these two Bills must alone be regarded as quite sufficient justification for the continuance of the organization. It is scarcely necessary to say that the good work done in this matter by Sir George Livesey for his engineering colleagues, who always had his warm sympathy—for he confessed that he felt he was more of an engineer than a director—will be remembered with gratitude; but unhappily it will be mingled with regret that his once active mind is now for ever at rest.

The circumstances which led to the lowering of the standard of illuminating power and the introduction of the Carpenter "Metropolitan" No. 2 burner will be well within our readers' recollection. Moreover, they have been dealt with elsewhere.

When referring last week to the late Sir George Livesey's connection with the Institutions of Civil and Mechanical Engineers, it should have been stated that he was also a member of the Society of Arts, as we learn from a brief notice of him which appears in the current number of the Society's "JOURNAL," that he was elected a member in 1873, and was on the Council in 1902. It may also be mentioned that the list of patents taken out by the late Sir George Livesey, given on p. 24, should have included one dated Jan. 31, 1908 (No. 2207), for burners for liquid fuel.

In the obituary notice of Sir George Livesey which appeared in "The Times" on Monday last week, a portion of which was reproduced in the "JOURNAL" next day, it was remarked, with reference to the deceased's co-partnership system, that "his efforts to induce the directorate of other companies to adopt a scheme on the lines of the South Metropolitan Company met with disappointment in almost every case." Possibly the writer meant Sir George's first efforts. However, Mr. Charles Hunt corrected the statement in a letter which appeared last Saturday, in the course of which he said: "A precisely similar scheme has been for many years in operation by the South Suburban Company, of which Sir George Livesey was also Chairman; and a few years later co-partnership or profit-sharing on similar lines was adopted by the Commercial Company (another of the three London Gas Companies), and also by the Chester and the Newport (Mon.) Companies, and the Stafford Corporation Gas Committee. Quite recently, moreover, a remarkable extension of the system has taken place. During the closing months of his strenuous life, Sir George Livesey had the satisfaction of witnessing its adoption by no fewer than six important Gas Companies—viz., the Tottenham and Edmonton, Leamington, Rugby, Bournemouth, Tunbridge Wells, and Walker-on-Tyne." Mr. Hunt added: "There could be no better testimony than this to the increasing appreciation of this admirable system, which unites not only employers and employed, but gas consumers also, in one common bond of self-interest,"

APPRECIATION FROM PROFESSIONAL COLLEAGUES.

From Mr. Corbet Woodall.

FOR forty years I enjoyed the friendship of Sir George Livesey. The intimacy of our friendship was interrupted for a short time—only to be renewed with undiminished cordiality.

Like all who knew him well, I admired the vigorous strength of his personality, the clear mind and independent thought which characterized him, and his freedom from the trammels of routine and custom. He had great confidence in his own judgment; and this brought him at times into sharp conflict with those who differed from him. Even then I think it was seldom that any doubt was entertained as to the singleness and purity of his motives.

His aspirations were unselfish, directed to noble ends; and it was due to his indomitable courage and resolution that he was able to see some of them brought to full fruition. His memory will long endure and be an incentive to those who follow.

As a personal friend, he possessed great charm. I never saw him to a greater advantage than when surrounded by a group of children, who found him a capital playfellow, with a heart as young as theirs.

He finished his course as most of us would wish to do, with a record of good work well done, and cheered by "that which should accompany old age, as honour, love, obedience, troops of friends." Of him, we can think only happy thoughts, though for ourselves we mourn a great loss.

To one whose loss is greatest of all—who helped in and sympathized with and inspired his work, who was "help meet" far beyond the common measure—we think with deepest sympathy; and will trust that in the love and admiration so widely shown to her husband she may find consolation in her grievous sorrow.

Westminster, Oct. 12, 1908. CORBET WOODALL.

From Mr. Thomas Newbigging.

MANY as have been the able men who have guided the destinies of the Gas Industry from its very inception until now, there is no name that stands out with such deserved prominence as that of the man whose mortal remains were laid to rest in Nunhead Cemetery yesterday afternoon.

I first became acquainted with Sir George Livesey in the year 1866, at the meeting of the British Association of Gas Managers held in St. Martin's Hall, Long Acre. During all the intervening years—although I differed with him on some questions—our friendship remained unbroken. It was always a pleasure to discuss gas matters with him, whether from an engineering or from an administrative standpoint.

We acted together in a number of cases, both before Parliamentary Committees and elsewhere; and we have corresponded, less or more, since our friendship began. Old associations always appealed to him. In the last letter I had from him—one of the very last he wrote, dated Sept. 1, just about a month before his decease—he remarked: "I attended the last meeting of the Institution of Gas Engineers, and greatly missed the old faces, of whom there were few present. Still, there was the old pleasant friendship and cordiality, and my paper (enclosed) was very kindly received." It is hard to realize that he has passed away from us.

There was something granitic about George Livesey, both in appearance and in character. He was "a hard nut to crack;" and those who attempted it sometimes broke their teeth.

But this was only one side of his complex nature. He was approachable by the humblest workman in his employ. It is well known, also, that his charitable gifts were both generous and widely distributed—to the extent that he would take the risk of being imposed upon rather than overlook a deserving case.

As a Gas Engineer he excelled in originality, ingenuity, and initiative. He was not afraid to translate his ideas into practice. In this respect, he had, of course, the advantage of being "a law unto himself," in so far as his own Company was concerned. His coadjutors on the directorate had such confidence in his judgment and ability as to allow him a free hand without let or hindrance.

Most of his inventions are in actual use to-day. But he never hesitated to abandon any idea which, after being worked out, proved to be without practical value. We all know, too, how he admitted any temporary failures, and recounted them that other engineers might profit by his untoward experiences.

He had the further sensible quality as a chief in the encouragement he gave to the clever assistants whom he gathered round him to work out their own practical views, if haply they could improve the methods of working at the different stations of the Company.

More than forty years elapsed between his first and last papers read before the different Associations; and the subjects were about as wide apart in matter as the papers were in time. The first (1867) was on "Purification by Ammonia," the last (this year) on "Co-Partnership."

But, noteworthy as he was as an Engineer, he ranked higher still as an Administrator. The reputation which the South Metropolitan Gas Company enjoys as a sound undertaking is mainly due to his untiring vigilance. The whole gas industry is

under obligation to him for his successful struggle to emancipate it from the vexatious as well as expensive and unnecessary trammels by which mistaken legislation bound it until within a very recent date.

As an expositor, he had few equals—whether in his letters to the Press, in the witness-chair, or presiding as Chairman over the meetings of his Company. There was a resonant force in his spoken word. As a witness, in his examination-in-chief, he could tell a straightforward tale that was convincing in its strength and thoroughness—giving the impression of absolute sincerity and the fullest acquaintance with his subject.

Strangely enough (though not really strange, if we think for a moment), he did not excel under cross-examination. I have often seen him in these circumstances, and he always appeared to me as though he were amused with the ingenious efforts of Counsel to thwart the views he had expressed, or to twist his words from their true significance. And so, being dubious of the examiner's *bona fides*, he was at a loss sometimes for a ready reply to the conundrums with which he was being pelted.

But there is this to be said. He is the only witness in regard to whom I ever felt that cross-examination was unnecessary. That, I think, was also the view generally taken by the adjudicators who had listened to him. Certainly, his evidence-in-chief was never weakened by any cross-examination, however adroit, or by any shrinking unreadiness of reply on the part of the witness.

His frugal habits, and his utter absence of personal display either in dress or manner, were well known. He never tried to produce an impression by any extraneous means. His immediate subject and his general work engrossed his mind to the exclusion of all adventitious aids.

Occasionally we were together on a case that necessitated a stay for a day or two at some distance from London. On such expeditions his only *impedimenta* consisted of a handbag about the size of a football, containing his nightclothes and a collar or two. At such times, I felt perfectly ashamed of my own bulky bag that I had to ask a porter to carry. To be sure, my hold-all was half taken up with papers and books of reference which I thought I might need in the course of the inquiry. His papers, when he had any, he carried in the breast-pocket of his coat.

Under all this absence of ostentation, he was proud and tenacious of the position to which—by sheer force of character—he had attained as leader in his profession; and he was eager to accept any suggestion the adoption of which was likely to strengthen his claim in that direction. For example, in the year 1895 we journeyed together down to Plymouth; and in the course of conversation he mentioned to me that the South Metropolitan Company were going to Parliament in the ensuing session with a Bill to consolidate the then existing ten per cent. capital stock into five per cent. stock. I remarked that this had already been done in several instances. "But why not go one better and make it four per cent.," I asked, "and so initiate a new departure?" He looked at me for a moment and his eyes sparkled. "You are right," he said, "four per cent. it shall be;" and so it stands in the Act of 1896. The Gaslight and Coke Company followed suit two years later.*

The Workers' Profit-Sharing or Co-Partnership Scheme, which he introduced after the great strike of 1889, has proved an unquestionable success, and that not in a pecuniary sense only. It has awakened many a working-man from the torpor of mean-thoughted indifference or worse, and given him a clearer vision and a wider horizon. It had become almost a passion with Sir George in his latter days; and it is to be hoped that nothing will arise to mar its progress now that he has left the helm. Whether in the future it is widely imitated and adopted or no, it is there as a monument of what may be accomplished by Socialism of a genuine type. Perhaps he "builded better than he knew."

One almost feels that he had done his work and left none of it unfinished. But, in our selfish way, we could have wished him spared to us yet longer. We are loth to part with him. There was such anchorage in the man.

Manchester, Oct. 11, 1908. THOMAS NEWBIGGING.

From Mr. Henry E. Jones.

IN fulfilment of my promise, I endeavour to express my sense of the calamitous loss which has befallen us. At the moment, I am unable to do more than deal with the personal side of it, as I have not recovered the "bolt from the blue" which on Thursday week came in a message that "no hope could be held out" that I could see again my friend of over 45 years.

Ever since, my mind has been filled with memories of that long intercourse, much to the exclusion of other things, and interfering even with sleep. Great in soul, of extraordinary courage, simplicity itself in manner and in habits of life, gifted with a positive genius for all that his professional and his business career demanded, quick and ready in perceiving the hidden truths in social as well as in professional complications, he was fruitful of solutions as he was swift, direct, and unswerving in dealing with them.

One could not help *relying* upon him; and such was his generosity of feeling, that no one ever relied upon him in vain. Could one help admiring him as a private friend, and frequently resorting to him?

In the earlier years of our friendship, before distance and circumstances—including the greater absorption of both of us in our own fields of operation—made it more difficult, we saw much of each other socially; and I can only hope I had his confidence as he had mine. Of course, we could not see always alike; but no difference of opinion estranged us. He was incapable of anything petty; and I even found him appreciative of independence and of earnest conviction in others. His own convictions, when arrived at, he followed in all conscience, with all his might, and with a force of character and directness which made him disregard forms and methods of diplomacy, so that inevitably he was occasionally misunderstood and misjudged. But his *completed* work always vindicated him.

Of all that he has done for Gas and Labour, I cannot speak here. It was magnificently testified to by the multitudes who attended in the streets and at his funeral to-day. No one looking into the faces of the multitude could fail to discern the mark that he had made on Labour; and the eloquent and fervid tribute to his unselfish, earnest, and unpretending life of love and charity, found an echo in the hearts of all his associates gathered there.

Truly, "A Prince has fallen in Israel," and the gas world has lost a discerning leader and a dauntless champion, such as can not be replaced in the opinion of his old friend

Marden Ash, Ongar, Oct. 10, 1908. HY. E. JONES.

P.S.—Among the work he accomplished no one has yet referred to his getting rid of the unsatisfactory *revising* arbitrations that preceded the sliding-scale for the Metropolitan Companies.

From Mr. Sydney Y. Shoubridge.

EVERYONE connected with the gas industry is mourning the loss of the great leader, who has been taken from us; but we have not yet realized the extent of the gap which he has left behind him. To those, like myself, who had the honour to serve him and enjoy his intimate friendship, Death has dealt a severe blow, from which we shall not readily recover. To know Sir George intimately, was to love him. His treatment of those who served him was ever of the kindest. Always the most approachable of men, he made time to listen to everyone who went to him, and to help them to the utmost of his power. If he had any respect of persons at all, it was that he gave the most attention to the poorest and humblest of those who needed his advice or assistance. His generosity was unbounded; and every case of need which came to his notice met with instant and substantial relief. He had the simplicity and modesty characteristic of truly great men; and though his knowledge of all that pertained to his profession was profound, he was always ready to listen to the opinion of those with whom he worked, and never failed to give full credit for every suggestion made to him of which he approved.

His solicitude for the welfare (both in material and spiritual things) of those who served him, which was always strong, became deeper and more earnest with increasing years, and it was uppermost in his thoughts during the last year of his life. The spotless purity of his life and conversation, his modesty and humility, were the natural outcome of his deep piety, and of his endeavour to follow in the footsteps of the Master. His love of righteousness and justice made him keen to resist with all his might anything that seemed unfair and unjust, either in public or private affairs; and never was a more strenuous fighter for what he believed to be right.

Determined perseverance against all difficulties, and in spite of every obstacle, was one of his most striking characteristics; and it accounts, largely, for his success in life. He was a profound thinker, who studied with laborious care every subject that he took in hand; and his mastery of detail was remarkable. He had the gift—often found in great men—of a most retentive memory; and he could instantly recall with wonderful clearness the details of events that happened very many years ago. His conduct of business was rapid, but without haste. He neither wasted words nor wasted time, but kept closely to the matter in hand; so that in an hour he was able to accomplish more than most men would do in three.

The gas industry has lost a great benefactor, who did more than any man for its advancement; and I am sure there is a general desire that something should be done to show the appreciation of his services which is felt by all.

We have lately been shown that the Heroes of Peace deserve equal recognition with the Heroes of War. Of all the heroes of peace, none has deserved more at the hands of his countrymen than the great captain of our industry just laid to rest with such imposing solemnity. For, single handed, against tremendous odds, he fought for years, with undaunted courage and unflagging zeal, to establish a system which would ensure "Righteous Peace in the Industrial World." This was his greatest achievement; and it is, of itself, sufficient to entitle him to a place among the noblest benefactors of mankind.

The citizens of South London, where he laboured all his life and is now resting, would honour themselves if they erect a worthy memorial of him in their midst; and the park on Telegraph Hill, which he gave them, seems a fitting place for it. But I appeal to the gas industry to show its appreciation of his work in a way which I know would have pleased him best—namely, by carrying on the great purpose of his life, the spreading of the co-partnership system throughout the world. It is possible in this way for

* I hope I may be pardoned for mentioning this personal incident. Sir George always gave me credit for the suggestion.

each Gas Company to erect an imperishable monument to his memory, which would remain untarnished to the end of time; a monument which would cost nothing to establish, but when complete, would bring peace, happiness, and prosperity to all within its influence.

Those of us in the South Metropolitan and South Suburban Companies, who have had the honour and privilege of working with Sir George in this matter, deem it a sacred duty to help others to adopt the system and secure the advantages we enjoy; and no one shall ever apply for our assistance in vain.

I hope and believe that this appeal will meet with a response worthy of the object and of the industry.

SYDNEY Y. SHOUBRIDGE,
Engineer, South Suburban Gas Company.

Lower Sydenham, Oct. 10, 1908.

From Mr. Chas. M. Ohren.

I REGRET I was upon my vacation when the sad intelligence reached me of the passing away of our revered friend and adviser, Sir George Livesey. Consequently, I was unable, in your last issue, to pay a slight tribute in your columns to his memory.

After an intimate knowledge of Sir George in connection with this Company for more than 35 years, and for the last 15 years as Secretary of the Company, under his chairmanship, I claim an acquaintance, through the confidences he reposed in me, not enjoyed by many.

He was a sterling, genuinely true friend to all who approached him for advice or assistance; generous to a fault; and not letting his "left hand know what his right hand doeth"—a man whose exceptional abilities were always ungrudgingly at the service of the gas industry for its good and advancement; and, although a born leader of men and an ardent fighter, he always used his giant intellect with tolerance and encouragement.

Sir George will indeed be missed—not only as our Chairman, but as our tried and trusted friend. His loss is deeply mourned by all here, from the Director in the Board-room to the boy in the workshop.

All that can be said of him has been told in your "Obituary Notice," and by his intimate associates; so I will close this small tribute of appreciation by reiterating the most appropriate words in Mr. Bush's letter: "Take him for all in all, we shall not look upon his like again."

CHAS. M. OHREN, Secretary,
Oct. 8, 1908. South Suburban Gas Company.

From Mr. Thomas Glover.

I DEEPLY appreciate your thoughtfulness for the Institution of Gas Engineers in allowing its President to add a word of tribute to the memory of its most distinguished member.

I am only expressing a commonplace when I say that Sir George Livesey was held in the deepest respect by every member of the Institution. This was due to his commanding personality, his untiring and devoted service to the industry, and his unique knowledge of its history and development. In him, we saw one whose simple habits of life were consistent with strenuous toil. The conception and pursuit of lofty ideals were the counterpart of a man with a most practical mind; so that he was able to carry the responsibilities of huge businesses and yet constantly be seeking the betterment of his fellows and the perfecting of industrial methods.

The meetings of the Institution were raised to a higher level by his presence, by the papers he read, and by the part he took in the discussions, when he drew from his rich stores of knowledge and experience.

He leaves us, who are less gifted, a noble and inspiring example; and we can perhaps best show our appreciation of the service he rendered to our industry by applying a similar devotion to its welfare and development.

Norwich, Oct. 10, 1908. THOMAS GLOVER.

From Mr. James W. Helps.

IT is getting on for thirty years since I first met Sir (then Mr.) George Livesey. It was in Mr. Corbet Woodall's office that I was introduced to him. I was a young man at the time, and of course quite unknown. But when Mr. Livesey shook me by the hand, and chatted pleasantly with me, he made me forget for the moment the difference which existed in our relative positions—only to realize it with all the more force when I left his presence. It was this natural power of placing at their ease all those who were fortunate enough to meet him, that constituted one of the principal charms of the great man who has just left us.

Above all things, Sir George was a man who never took up a matter unless he thoroughly believed in it; and having once taken it up, he concentrated upon it all the wealth of his intellectual and physical powers, while he never allowed personal considerations to unduly weigh with him in his efforts to right a wrong or expose an abuse.

Naturally, such a man found at times many to differ from him; but no one ever knew him to take an unfair advantage or shirk an encounter. He hit hard, it is true; but he always welcomed an equally lusty return. Truly may he be called the "St. George" of our industry—an industry which he loved; for which he has done more than any other man connected with it; the honour of which he defended with all the force of his powerful personality; and to which he devoted the work of a lifetime.

Now he has gone, leaving behind him thousands to regret their loss, and an honoured name which will live in the loving memories of all of us until our time comes to follow him.

Croydon, Oct. 10, 1908. JAMES W. HELPS.

From Mr. Alexander Wilson.

As an office-bearer of the Institution of Gas Engineers, I would like to add my tribute to the memory of our great member who was laid to rest on Saturday last. The thousands who attended the sad ceremony were a most eloquent testimony to the value of the life and work of Sir George Livesey; and the feeling shown and expressed gave ample proof of the place he held in the hearts of all those who were privileged to have been in intimate contact with him.

While he will be ever remembered with love and gratitude by those for whom he did so much in his kindly and unostentatious way, the name of Sir George Livesey will have its most lasting memorial in the work he has done for the gas industry and the various interests in connection therewith.

Out of the foundation of his well of knowledge and experience, he gave to all who needed help or enlightenment, unstintedly and ungrudgingly; and the reports of our Institutions are full of the records of his valuable work and experiments. As time goes on, these records will be read and re-read by those who come after us, and who will hand on to posterity the benefits derived from the ideas which had their inception in the active brain of him whose work is done.

If the technical work he did led to so important and valuable results, what can be said of the benefits that will accrue to all from the example of his life and character? No one can even attempt to estimate, far less record, the effect of his influence and example on all connected with the gas industry.

During the time I was resident in London, I met Sir George on several occasions; but I had later the privilege of being closely associated with him in an inquiry in Glasgow, and ever since then I have had the highest opinion of his power and knowledge. The force of his character, and his thoroughness displayed at that time, made an impression on me that I have never forgotten.

All who knew him will miss him and the hearty, friendly grip of his hand; and though we have still many eminent names on the roll of our Institution, we can ill-afford to lose one who was without doubt the outstanding man of them all.

ALEXANDER WILSON.

Kelvinside, Glasgow, Oct. 12, 1908.

From Workmen Directors of the South Metropolitan Gas Company.

ON this sad day of the funeral of our beloved Chairman, Sir George Livesey, the minds of all fortunate enough to have been brought into contact with his great personality cannot but focus the years that end with him, and recall the life so unsparingly spent in the service of his fellow men.

It has been our special honour and privilege to be closely associated with him and the Directors and officials and men in the great scheme of co-partnership established within the borders of the South Metropolitan Gas Company. With intimate knowledge from the centre to the circumference, we should speak with authority of the system which has rendered such a connection possible, and brought about so happy a condition of things as at present subsists between the Company and their employees. In spite of our grief, it must be exceedingly gratifying to all in the Company who assisted Sir George in the work to which he so ardently devoted the ripest years of his life to look back knowing that he whose heart desired, whose intelligence planned, and whose strength supported this way to peace in the industrial world was not taken away before co-partnership was firmly and thoroughly established among us. Our Chairman lived to see the system a success, and was rejoiced by the certainty that good far beyond what he himself ever anticipated had resulted from it. He relied upon his men; and the trust reposed in them we know has not been, and we are confident will not be, misplaced. As the employees were the first to take hold of this good thing, so will they be the last to part with it.

At no period in its history has our co-partnership been healthier; and when we think of the recognition—recognition in its best form—that we have through our Co-Partnership Committee, and of the more than £350,000 that our 5000 co-partners possess in the Company (which means, omitting officers, an average of nearly £60 to each weekly wage-earner), we are sure there will be a general determination to make it still stronger. But we should be sorry to measure merely in money the value of Sir George's life to us. His call to a sterling manhood was an inspiration that found response in many a hard-handed worker who, while perhaps incapable of reaching the heights attained by our Chairman, yet turned his back on the depths, and went forward and upward, gaining in self-respect at every step, to find himself a better man, a better citizen, through the teaching of him whose loss all are now deploring. Workers learned to aim at a higher standard of living; and with his example before them, they profited. Brighter homes and happier wives and children testify to the solidity of his hopes. Sympathy in Sir George's case was not content to loiter in words, but translated itself into prompt and effective action.

Even in this respect, our people have caught the infection of his enthusiasm; and to-day throughout the various works of the Company men regularly give generously and freely to our many Hospital and Benevolent Funds. The spirit of co-partnership has done this and much more in inculcating the good and bringing into play that which is best in man. Tolerating nothing mean in his own life, Sir George admired the estimable use the men made of the better means that followed their steady industry. Their benevolence, their self-reliance, their freedom of action, pleased him. He endeavoured—and succeeded, too—to improve the worker's condition in life by helping him to help himself; and it was his frequent boast that the advantages of our co-partnership are in no wise due to charity. His was a happy life; and he desired the happiness of others. But he was a steadfast worker. He had no patience at all in schemes and agencies that achieved nothing. He chose the—

Path to a clear purposed goal,
Path of advance!

We have lost a friend; but his influence remains, and is ours. The great scheme of our co-partnership under his guidance became a substantial structure, and, founded on principles of right and justice, will be maintained in sound order by those—and they are thousands—who have had the good fortune to take part in this work for the improvement of employees, and so for the betterment of their country. Our method is evolved by necessity for peace, if industry is to be carried on in comfort. It is a natural outcome of the wish to prevent conflict between master and man. In the South Metropolitan Gas Company, Capital and Labour work for, and not against, each other; and we claim that, as co-partnership has succeeded with us, so will it succeed elsewhere, wherever breathes the spirit of Sir George Livesey—the spirit of goodwill.

Employee Directors { H. Austin. H. T. Manley. C. T. Drumgold.

South Metropolitan Gas Company,
London, S.E., Oct. 10, 1908.

Mr. J. A. Butcher, whose place Mr. Manley took on the Board at the beginning of this year, desired to be associated with his old friends in what they here say.

TOKENS OF RESPECT AND SYMPATHY.

From the North British Association of Gas Managers.

Gas-Works, Uddingston, Oct. 6, 1908.

To Lady Livesey, Shagbrook, Reigate.

Dear Madam,

It was with feelings of the deepest regret that the members of this Association learned of the death of your beloved husband, Sir George Livesey.

The Executive Committee have requested me to convey to you an expression of their sense of the loss which has been sustained by the gas industry through the death of one who has for many years been its recognized leader.

The Committee feel deeply and sincerely for you and your family in your bereavement, and tender to you their heartfelt sympathy.

I remain,
Yours respectfully,
For the North British Association of Gas Managers,
L. Hislop, Secretary and Treasurer.

From the Manchester District Institution of Gas Engineers.

Oct. 7, 1908.

Dear Lady Livesey,

At a meeting of the Council yesterday, I was directed to convey to you the sincere condolence of the members in your sad bereavement.

Sir George will ever be remembered as a great leader and friend in the gas world; and he has passed away treasured and beloved by all who knew him.

The separation is indeed a sore trial; and may the Great Consoler sustain you in this your great affliction.

Yours faithfully,
W. Whatmough, Hon. Secretary.

From the Midland Association of Gas Managers.

Craigside, Rugby, Oct. 9, 1908.

Dear Lady Livesey,

On behalf of the Committee of the Midland Association of Gas Managers, I beg to convey to you and to your Ladyship's family their deep sympathy and sincere condolences in your sad bereavement.

Wherever even the smallest branch of the gas industry exists, Sir George's name is known and revered; and to the great majority of gas engineers, to whom Sir George was personally known, his death will appeal as not that merely of the great leader of the industry but of a kind personal friend.

The permanent establishment of Sir George's scheme of Co-Partnership between employers and employees was the crowning act of a good life; and I feel sure it must afford some consolation to your Ladyship to know how rapidly the scheme is spreading, and that so many thousands of gas-workers throughout the country live to bless Sir George's name.

With deep sympathy and a keen sense of personal loss
I am, dear Lady Livesey,
Yours sincerely,
C. Meiklejohn, *Hon. Sec.*

From the Southern District Association.

The President and Committee of the Southern District Association of Gas Engineers and Managers, assembled for the purpose of attending the funeral of the late Sir George Livesey, desire to express, both as individuals and on behalf of the members generally, their deep sympathy with Lady Livesey and other relatives in their bereavement; to record their heartfelt sorrow at the loss of the distinguished leader of the gas industry; and to testify to the strong feelings of admiration, respect, and affection with which he was regarded in the Association, of which he was an honoured member of very many years' standing.

From the Eastern Counties Gas Managers' Association.

We learn from Mr. T. A. Guyatt, the Hon. Secretary of the Eastern Counties Gas Managers' Association, that a letter of condolence has been sent to Lady Livesey, on behalf of the President and Committee of the Association, expressing their sincere sorrow at the death of Sir George, and their sympathy with her in the irreparable loss she has sustained.

From the Wales and Monmouthshire District Institution of Gas Engineers and Managers.

Gas Offices, Pentre, Rhondda, Glam., Oct. 9, 1908.

Lady Livesey, Shagbrook, Reigate.

My Lady,

I am instructed by the Council of the above Institution to convey to you and family their deepest sympathy and sincere condolence in your sad bereavement.

In the death of Sir George the gas industry has suffered a loss which will not be easily replaced; but his work will long remain a memento of his life.

Believe me to remain,
Yours sincerely,
Octavius Thomas, Hon. Secretary.

From the Directors of the Commercial Gas Company.

From a letter received from Mr. H. D. Ellis, Secretary of the Commercial Gas Company, we learn that the Directors, at their meeting last Thursday, passed a resolution expressing their sorrow at the death of their former colleague, Sir George Livesey, and placing on record their sense of the services he rendered to the gas industry and all interested therein—proprietors, consumers, and workers. An expression of sympathy has also been tendered to Lady Livesey.

From the Employees of the South Suburban Gas Company.

South Suburban Gas-Works, Sydenham, S.E., Oct. 4, 1908.

Dear Lady Livesey,

It is with the deepest regret that we learn to-day of the death of our beloved Sir George; and we beg to express our deepest sympathy for you in the great loss of your noble husband. Never shall we cease to mourn his loss, or forget the great good he did for us all.

The employees of the above Company attended a special service this afternoon to ask Almighty God to give you strength to bear your great loss; and we know our prayers will prevail.

I beg to remain,
Your Ladyship's humble servant,
W. G. Waller, Employee Director.

Sir George Livesey and the Junior Associations.

As proof of the interest taken by the late Sir George Livesey in the endeavours of the younger men of the profession to improve their position in the gas industry, we give the following letter which Mr. W. J. Liberty, the President of the London and Southern District Junior Gas Association, recently received from Sir George:—

> The proposed meeting and visit at the Old Kent Road works, on the afternoon of Saturday, the 5th of December, will be just the thing. It will be much less formal to have a friendly talk at the gas-works than to give a set address at the opening meeting. I shall be very pleased to meet and make the acquaintance of your members, for whom I entertain a strong feeling of respect, as the result of reading their excellent papers and of what I have otherwise heard about them. I am glad to hear that among them are a number in sympathy with co-partnership.

Resolution of the Camberwell Borough Council.

The Camberwell Borough Council last Wednesday evening passed a vote of sympathy with Sir George Livesey's relatives, and decided that the Livesey Public Library in the Old Kent Road—his gift to Camberwell—should be closed on the day of the funeral from 10 a.m. to 6 p.m.

The Last Tribute of "An Ardent Admirer."

The long procession to the grave has passed
Of those who honoured and who loved him best;
The never-tiring heart has found at last
A well-earned, perfect rest!

Sweet is the sleep of him whose life was spent
In tireless effort for industrial good,
Whose work remains a nobler monument
Than ever marble could.

We think of him, and, oh! how strong we feel,
So full of strength was the example set!
Could we press on with only half the zeal,
How forward we might get!

Deeply to heart we'll take the lesson rare,
And strive amain to do our duty well;
To fill the gap of one we ill could spare,
Who led us till he fell!

And such a leader may not rise again,
Though all the flags of earth may be unfurled,
To guide aright with such a heart and brain
A great industrial world.

Sweetly he sleeps; the hands upon his breast
Lie folded now in their eternal peace;
And may his spirit find in such a rest
The joys that never cease!

From the "Surrey Mirror and County Post," Oct. 9.

To say that Sir George Livesey was loved by all with whom he came in contact would be merely clothing a cherished fact in cold-sounding words. Of a genial and kindly disposition, he was an ideal master, a devoted companion, and a faithful friend; and in the district in which he had lived for the last fourteen years he will be sadly missed for a very long time to come. The enormous demands of the South Metropolitan Gas Company, of which he was Chairman, claimed by far the major portion of his extraordinary activity, and left but little time for leisure or opportunity of taking part in local affairs. Sir George will, of course, always be remembered for his exploits, as one London paper not inaptly termed it, as a Captain of Labour; but locally his memory will be cherished for acts of kindness performed in an unostentatious but sympathetic manner, which enhanced the value of every good deed and the pleasure of its acceptance. The deceased gentleman was widely known for his advocacy of total abstinence; and he took a keen and practical interest in the work of the British and Foreign Bible Society—presiding at the annual meeting of the local auxiliaries on a number of occasions, and appealing for interest in its work in forcible and eloquent terms. Sir George manifested a warm interest in the Mission Church at Reigate Heath, and was a generous contributor to the fund raised for its erection. He was a constant worshipper at Buckland Church and frequently attended the Heath Church, in which he took a deep and practical interest. Sir George was a Governor of the Redhill and Reigate Hospital, and took a warm interest in its welfare. He was present at a meeting of Governors held at the Hospital on the 10th of August, when the rules were revised. This was one of the last engagements he attended in the borough.

From the "Middlesex County Times," Oct. 10.

The Paddington Correspondent of the above-named paper wrote under the heading of "G.W.R. Notes" as follows: "The death of Sir George Livesey, which took place a few days ago, has removed a 'Captain of Industry' who could ill be spared. He will be remembered by Great Western men on account of the very able paper on 'Co-partnership,' read by him before the Debating Society last March. . . . Sir George's visit to Paddington was with the object of proving to the members of the Society that the principle of co-partnership was peculiarly applicable to railways. Whether that is so remains to be seen; but no one could fail to be impressed by the sincerity and conviction with which he spoke. It was his unshaken opinion that co-partnership would solve some of the most acute social problems; and he never lost faith in it as a means of improving the condition of the working classes, and of securing industrial stability. He was loved by his men, respected by his opponents, and honoured by all; and his death will cause a blank in the industrial life of South London which cannot easily be filled."

Pulpit References.

At St. Mary's Church, Buckland, on the morning of Sunday the 4th inst., the Rector, the Rev. S. Wetherfield, said he could not close the service without a reference to the loss the village had suffered by the death, at nine o'clock that morning, of Sir George Livesey. He was undoubtedly a great and good man; his perfect life was an example to them all. . . . He was a man who through life did not let his left hand know what his right hand did. He was a devout member of the Protestant Church of England, and a regular worshipper in that sacred building. The words of the great Apostle St. Paul were most applicable to him: "I have fought a good fight; I have finished my course; I have kept the faith. Henceforth there is laid up for me a crown of righteousness." [A memorial service was held in the church at 3.15 p.m. on Saturday, to synchronize with the funeral at Nunhead.]

At the Heath Church, Reigate, in the evening of Sunday, the Rev. V. G. Banham made a sympathetic allusion to the death of Sir George Livesey, who, he said, was a frequent worshipper at the church and a generous contributor to its funds.

MEMORIAL SERVICES.

At the St. Alfege Church Room, Greenwich.

At the request of Messrs. J. F. Braidwood and Joseph Tysoe, the Engineers of the West and East Greenwich stations of the South Metropolitan Gas Company, a special service of intercession for Sir George Livesey was arranged to be held on the afternoon of Sunday, the 4th inst., in the St. Alfege Church Room, Greenwich; but when the news of his death was received, the service was made of a memorial character. There were 120 present, including Mr. Braidwood, Mr. Tysoe, and Mr. H. Austin (one of the Workmen-Directors); and many of those present were wearing mourning. The service, which lasted about half-an-hour, and was impressively conducted by the Vicar of Greenwich and the Rural Dean (Rev. S. Martyn Bardsley), opened with the hymn "Brief Life is Here Our Portion;" and in the course of a short address the Vicar said that it seldom fell to the lot of a clergyman to have such a request as that which was made to him on the previous Friday by Messrs. Tysoe and Braidwood, to hold a special intercession service for the one who was now their late chief. He was extremely touched by the request, because in these days of Materialism, when people scoffed at prayer, it was indeed wonderful that the employees of one of the largest undertakings in South London should want to meet together to pray on behalf of their chief. He (the Vicar) felt that, however inconvenient it was, such a meeting must be held. But the worst, which they had least expected, had come to pass. Like the young prophet of old, he felt inclined to say, "Know ye not that your master has been taken from your head to-day?" Their chief had been removed by God to a higher service above. Was not their service rather one of thanksgiving than of prayer? They wished to thank God for a life which was full of usefulness, and for the influence that life exerted in South London. Though he did not know Sir George Livesey personally, he had read his speeches often, and appreciated the care and attention he always seemed to manifest for those whom he employed. Indeed, they thanked God for his life and example. He was in the truest sense a godly man—one who had an eye to God even in the common things of life. He tried to live and rule in the sight of God. They should not forget those who now mourned his loss, especially his widow, to whom it must be a great sorrow The Vicar concluded by reading portions of the Book of Wisdom, and the first chapter of the First Epistle to the Corinthians, and prayers from the Burial Service.

Before the congregation separated, Mr. Tysoe (who is an Alderman of the Greenwich Borough Council) said that they were all much indebted to the Vicar for his kind words of sympathy. Those of them who knew their late beloved chief intimately could not but feel very heavily the loss which had befallen them. They had hoped that his life would have been spared a little longer. But God had determined otherwise; and the blow had fallen with great suddenness. He could not trust himself to say much about Sir George; but they all knew the value of his life, which was a sufficient guarantee that he had gone to a better life above. He hoped the example set by their late Chairman would not be lost.

In closing the service, the Vicar paid another tribute to the affection and regard in which Sir George was held by those who worked under him.

At Holy Trinity Church, Sydenham, and at the South Metropolitan Company's Institute, Old Kent Road.

Similar services were conducted by the Vicar (Rev. W. H. Langhorne) at Holy Trinity Church, Sydenham, for the employees of the South Suburban Gas Company, and at the South Metropolitan Company's Institute in the Old Kent Road, by the Vicar of Christ Church, Old Kent Road (Rev. Frank Hobson); the latter being attended by the Secretary of the Company (Mr. F. M'Leod), and the Chief Engineer (Mr. Charles Carpenter). At Holy Trinity, Sydenham, there were present some 500 employees of the Company and their wives, together with three of the Directors—Mr. Chas. Hunt, M.Inst.C.E., and Messrs. Waller and Wyllie (the last two being representatives of the workmen on the Board); the Engineer, Mr. S. Y. Shoubridge, with Mrs. and the Misses Shoubridge; Mrs. Charles Ohren, wife of the Secretary of the Company, and Miss Ohren; Mr. John W. Whimster, Assistant-Engineer; Mr. H. J. Heading, Superintendent of the Rental Department, and Mrs. Heading; Mr. Jones, Secretary to the Co-Partnership Committee; Mr. Baldry, Superintendent of the Outdoor Department; Mr. Malster, chief foreman; Mr. Fowler, storekeeper; Mr. Joseph Trevitt, the Missionary at Lower Sydenham of the London City Mission; Rev. S. Schor, the Curate of Holy Trinity; and the Churchwardens, Mr. Vining and Dr. Gardiner.

The service having commenced by the singing of the hymn, "O God, Our Help in Ages Past," the Vicar read passages of Scripture; and these were followed by another hymn. In the course of his address, the Vicar said they had met together to beseech

the Almighty to spare the life of Sir George Livesey; but their service would be of another character, for a telegram had been received only a few hours previously to say that Sir George passed away at nine o'clock that morning. [As this was the first intimation most of those present had had that the end had come, it produced a profound impression, and deepened the solemnity of the proceedings.] A great and good man had been taken from them—one who had spent his life in trying to improve the condition of those employed by the two great Gas Companies of which he was Chairman, and in doing good in numberless ways, especially among the poor. He had ever been ready to help those who were in distress; and by the co-partnership system which he devised and introduced he had conferred great and lasting benefit upon his employees, and had shown the world how capital and labour could work amicably together to their mutual advantage, and how disastrous strikes, such as that now ruining the cotton operatives and cotton trade in Lancashire, could be prevented. They would mourn the loss of a true friend; but they would rejoice that he had now entered into rest, and was enjoying the reward of his faithful service here, waiting at God's right hand for those he left behind, whom he had taught to look to the Saviour for salvation. By their presence there, he (the preacher) concluded that they were believers in the power of prayer; and, if time permitted, he should have liked to deepen their faith by relating some instances of wonderful answers to prayer that had come within his experience. If, however, there were any present who had not made up their minds to follow in the narrow way which led to salvation—the way in which Sir George had followed his Master—he begged them to delay no longer, but there and then to ask God for pardon and for peace. Sir George would not have died in vain if through his death souls were won for Christ that day. While there was no need for them to pray for Sir George, for he was safe and in the keeping of his Lord, they could and ought to pray for one who was very dear to him—for the stricken lady whom he had left. Their hearts were full of sympathy for Lady Livesey in her grief and desolation; and he asked them all to engage in silent prayer that the Almighty would support and comfort her in this hour of trial.

After some time had been spent in silent prayer, Mr. Trevett offered prayer for Lady Livesey. The hymn, "Now the Labourer's Task is O'er" was sung; and the service ended by the congregation standing while the Dead March from "Saul" was played by the organist.

OBITUARY.

The death occurred on the 3rd inst., at his residence at Clifton, Bristol, of Mr. GEORGE KELSON STOTHERT, the Deputy-Chairman of the Bristol Gas Company. Deceased, who was in his 76th year, was senior partner of the engineering firm of Messrs. Stothert, Slaughter, and Co., Limited, of Bristol. He was a member of the Institutions of Civil and Mechanical Engineers.

The proceedings at the recent meeting of the Iron and Steel Institute at Middlesbrough were saddened by the sudden serious illness of the Secretary, Mr. BENNETT H. BROUGH. He was removed to Newcastle, where an operation was successfully performed; but, unfortunately, he succumbed to it. Mr. Brough, who was 48 years of age, was an associate of the Royal School of Mines, a Fellow of the Geological Society, of the Institute of Chemistry, and of the Chemical Society, and a member of the Council of the Institution of Mining Engineers, of the Chartered Institute of Secretaries, and of the International Testing Association. He was once instructor in mine surveying at the Royal School of Mines. Mr. Brough leaves a widow and two children.

We regret to learn that the Junior Institution of Engineers have lost their President, M. GUSTAVE CANET, the eminent French artillerist, who died at St. Aubin-sur-Mer, France, last Wednesday. We was an honorary Director of the Schneider Gun Manufacturing Company at Creusot, whose works there and at Havre were visited by the Institution in the summer. M. Canet had held the position of President of the Society of Civil Engineers of France; and he was an honorary member of the Imperial Technical Society of Russia, of the Iron and Steel Institute, and of the American Society of Mechanical Engineers. He was also a member of the Institution of Civil Engineers, an associate member of the Institution of Naval Architects of England, and a member of the Naval Institute of the United States.

The death of Mr. EDWARD JAMES PURNELL took place on Monday last week, at his residence in Coventry. Deceased was in his 80th year, and was the oldest of the Coventry Corporation officials; holding at the time of his death the office of Consulting Water Engineer. His first appointment under the Corporation was as City Surveyor and Water Engineer in 1867. He retained the combined positions until 1897, when the offices were separated on account of Mr. Purnell's age and the growth of the Water Department. Deceased was the Water Engineer from 1897 to early last year, when he resigned, and was appointed Consulting Water Engineer, being succeeded by Mr. J. E. Swindlehurst. Mr. Purnell was a native of Bristol, and went to Coventry from Wolverhampton (where he was Borough Surveyor) in the year 1867. He carried out numerous private water and sewage schemes in various parts of the country, many of them being local ones. He was a Director of the Kenilworth Water Company from its formation.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 153.)

THE past week was one to be graven deeply in the history of the world; and in the cosmos of Capel Court the undreamt of re-opening of the Eastern Question, with all its tremendous potentialities, produced little less than dismay. For the horizon looked so calm, and, with money so cheap and abundant, operators were beginning to enjoy a good time, when the whole structure was shattered at one stroke. It was too sudden and too big to be sized up altogether when the markets reopened on Monday. They, however, kept their heads pretty well and did not become "panicky," though Consols, of course, dropped, and the issues of the States immediately affected were flat, and the tendency downward was general. Tuesday was very sensitive. Consols had a further fall, and dragged others down with them. But many were shy of doing business at all, and preferred to await developments. The question looked no brighter on Wednesday. Realizing was the order of the day, and prices fell steadily till the figure Consols were offered at brought in buyers, and then there was a little recovery. But Thursday was weak again, and everything gave way. Friday was worse than ever. Pawned stocks had reached their margins and were thrown on the markets, and Consols touched $83\frac{7}{8}$ for the account. The move of the British squadron gave rise to warlike rumours. But a turn came on Saturday, and there was a fair recovery all round; Consols being done at $84\frac{7}{8}$ early in the day. The Money Market was naturally affected, though not violently, by current events, and rates for discount steadily hardened. The Gas Market, happily remote from the tempestuous cyclones raging elsewhere, can scarcely be said to have been at all affected by the turmoil, unless the retrogression in the leading issue's quotation (the only fall in the week) is to be attributed to it. Certainly no other cause suggests itself. The opening price on Monday was $99\frac{5}{8}$, a figure which later on eased down to $98\frac{1}{4}$. The secured issues were steady; the maximum stock marking $88\frac{1}{4}$ and $88\frac{1}{2}$, the preference from $105\frac{1}{2}$ to $106\frac{1}{4}$, and the debenture $86\frac{3}{4}$. South Metropolitan was quiet and unchanged at from $120\frac{1}{2}$ to $121\frac{1}{2}$; and the debenture was done at $84\frac{1}{2}$. In Commercials, the 4 per cent. changed hands at from 106 to $108\frac{1}{2}$; and the $3\frac{1}{2}$ per cent. at 103 and $104\frac{1}{2}$. In the Suburban and Provincial group, Brentford new gained a point, with business done at 186, British marked $42\frac{3}{8}$, Hastings $3\frac{1}{2}$ per cent. $94\frac{3}{4}$, Tottenham "B" 106, and West Ham from $102\frac{3}{4}$ to $103\frac{1}{2}$. In the Continental companies, Imperial was steady, changing hands at from $182\frac{1}{2}$ to 184. European was strong; the fully-paid marking from $23\frac{5}{8}$ to $24\frac{1}{8}$, and both issues advancing half-a-point. Tuscan marked $10\frac{1}{2}$. Among the undertakings of the remoter world, Bombay was done at $6\frac{1}{8}$, Melbourne 5 per cent. at $100\frac{1}{4}$, Monte Video at $11\frac{3}{4}$ and $12\frac{1}{4}$, Primitiva preference at $5\frac{1}{16}$ and $5\frac{1}{8}$, and River Plate at $13\frac{7}{16}$ and $13\frac{5}{8}$.

THE INSTITUTION OF MUNICIPAL ENGINEERS.

IN connection with the Institution of Municipal Engineers, whose draft bye-laws were submitted to a general meeting of members at the Bedford Hotel, W.C., last Friday, it may be stated that the membership roll now stands at 345—a result which can be regarded as most encouraging for an organization that has to measure its previous existence by months. The objects with which the Institution has been established are the promotion and advancement of municipal engineering, and the maintenance of the interests of the profession. There are to be members and honorary members, and also a class of students. Candidates for membership must have been trained as municipal engineers, and hold responsible engineering appointments to public authorities, or be engaged in such other manner as may in the opinion of the Council warrant them being put forward for membership. Students are to be persons engaged in municipal engineering who are not, in the opinion of the Council, experienced enough to be proposed as members, or persons who are preparing to enter the municipal engineering profession. No person, however, will be permitted to remain a student after having reached the age of 25 years. For members the entrance fee is a guinea, with an annual subscription of a like sum; and for students the entrance fee and subscription are half-a-guinea each. The question of entrance fees is, however, to remain in abeyance during the pleasure of the Council. The Council are empowered to arrange districts throughout the United Kingdom and the Colonies suitable in area for purposes of local administration. Examinations open to students and members are to be held in all the chief branches of the municipal engineering profession; and a journal will be issued quarterly, or at such other intervals as the Council may decide. As stated in last week's "JOURNAL," the Executive Committee decided, in order to make it an Institution of Municipal Engineers in the widest sense of the term, to admit as members men holding important appointments under local authorities as electrical, gas, mechanical, and water engineers. In fact, the idea is to make the Association fully representative of the profession of municipal engineering. The Secretary is Mr. B. Wyand; and the address of the Institution is now No. 39, Victoria Street, S.W.

RATIONAL OPERATING OF WATER-GAS PLANT.

THE fact that the conditions prevailing in a water-gas generator are changing from moment to moment as the operations necessary for the production of water gas proceed, makes the problem of how to work the plant to the best advantage a very difficult one. In ordinary practice, the air-blast is maintained for a definite period fixed at two, three, four, or more minutes, according to the construction of the plant, the pressure of the blast, and the ideas of the operator. Similarly, the "run" is maintained for a fixed period, of (say) five, six, seven, or more minutes. Ordinarily, the blast pressure and the current of steam are not varied during the "blow" and "run," though it is obvious that there is an enormous difference between the temperature of the bed of fuel at the commencement and end of each period. Thus, to take the "run" only, at the start the bed of fuel is, as a whole, at a very high temperature, in virtue of which it is competent to interact with or decompose a very large quantity of steam per second. But the reaction and the outflowing gas rapidly remove heat from the fuel, and, consequently, its temperature has become relatively low by the time the run is approaching its close. At this lower temperature the bed of fuel is competent to interact with or decompose a much smaller quantity of steam per second than at the high temperature which prevailed at the commencement of the "run." The consequence is that, whereas ordinarily the steam introduced is wholly decomposed in the early stages of the run, and the rate of gas making is then at its highest, towards the end of the run a large proportion of the steam passes through the bed of fuel undecomposed, and there is a great reduction in the rate of gas making. The effect of the superfluous steam towards the end of the run is three-fold. In the first place, it lowers the temperature of the generator through the sensible heat acquired by the steam in its passage through that vessel, and carried by it with the effluent gas to the condenser. Secondly, the surplus steam interferes with the proper course of the reactions, and both directly and indirectly causes the formation of bad water gas—*i.e.*, gas containing a high proportion of carbonic acid. Thirdly, there is a waste of boiler fuel expended in producing the surplus steam. Broadly, the deteriorating effect of the superfluity of steam is cumulative; so that when once the steam in the course of a run becomes in excess of the decomposing capacity of the bed of fuel, there is thenceforth a very rapid falling off both in the make of gas and in its quality.

Proposals have been made from time to time for operating water-gas plant in such a way that this falling off in either the make of gas or its quality, or both, should be reduced or avoided. For instance, Mr. W. J. A. Butterfield, in a paper which he read before the Institution of Gas Engineers in 1901,* suggested that the supply of steam should be gradually and continuously reduced from the commencement down to the end of the run, and that the reduction should be regulated according to the indication of the presence of undecomposed steam in the gas made. In a rough-and-ready manner, the necessary control ought, he thought, to be secured merely by observing whether steam was visible in gas blowing off from a pet-cock on the generator lid. By avoiding the passage of an appreciable quantity of undecomposed steam through the generator, he hoped to prevent an abnormal lowering of the temperature of the bed of fuel, and, consequently, to be in a position to extend the duration of the "run" by one to three or more minutes. It is obvious, however, that, while it may be possible thus to secure longer runs, the make of gas, which depends upon the quantity of steam decomposed, must fall off as the run proceeds in deference to the reduction in the supply of steam. Hence if the productive capacity of a given plant is not to be cut down to a considerable extent, a limit must be set to the duration of the runs which shall bring them to a close at the time when the make of gas per second becomes really small, even though, by regulating the supply of steam, it would be possible to continue to make gas of good quality for a longer period.

Mr. Butterfield's suggestion doubtless admitted of some appreciable lengthening of the runs and curtailing of the blows in plants which hitherto had been carelessly operated. His proposal, however, in the absence of any automatic device for controlling the supply of steam according to the indication of the presence of undecomposed steam, or of an abnormal proportion of carbonic acid, in the gas made, threw upon the operator the exacting task of regulating the steam-valve throughout each run according to one of these indications. As in ordinary working so much depends on the attention and carefulness of the operator, it is more than probable that the plants in which bad results had been obtained under the ordinary system of working would have done but little better if an attempt had been made with the same operators to follow his suggestions. Hence the alternative proposal of Professor H. Strache, of Vienna, which was referred to in the communication on the Strache water-gas process in last week's "JOURNAL" (p. 49), may in practice prove of much greater utility. Professor Strache proposes to stop the run as soon as the make of gas per second has fallen below a certain limit fixed for the particular plant. He ascertains when this limit is reached through an indicator which depends for its action on the pressure of the stream of gas passing from the set to the gasholder, which pressure varies with the rate of flow and, consequently, the make per second. He does not attempt to reduce the supply of steam in the course of the run, so that there is the usual gradual increase in the proportion of carbonic acid in the gas made as the run proceeds; but he prevents this proportion ever becoming excessive by stopping the run as soon as the make of gas falls off. The fall in the make naturally is attended by an increase in the amount of undecomposed steam in the gas; and it is this undecomposed steam which is responsible for a large proportion of carbonic acid being produced. Hence indirectly, Professor Strache's mode of operating avoids the average proportion of carbonic acid in the gas becoming unduly high; but Professor Strache would also, by way of further control of the operator, employ an automatic apparatus for obtaining a continuous record of the proportion of carbonic acid in the gas.

Incidentally, it may be remarked that such bad operating in the ordinary way of water-gas plant as is disclosed by the figures given by Professor Strache—viz., that 95 per cent. of the steam is undecomposed, and upwards of 20 per cent. of carbonic acid is present in the gas at the close of the runs—is seldom to be found with the water-gas installations in this country. Neither the apparatus for the continuous estimation of carbonic acid nor Professor Strache's indicator of the reduction in the rate of gas making was in existence at the time when Mr. Butterfield made his suggestions; and it is possible that by their assistance his intentions might now be carried out to better advantage—perhaps in conjunction more or less with Professor Strache's later developments. It should be made clear that Professor Strache's suggestions are applicable to existing water-gas generators of any make or type, and not merely to those which have for many years been on the Continent identified with his name as designer. It may well be worth the while of those in charge of water-gas installations in this country to consider whether they could advantageously employ the Strache indicator and "Autolysator" or some similar apparatus in connection with their plants. On the other hand, the considerations to which attention has been directed in this article may suggest to them some alternative scheme for the attainment of the same end.

* See "JOURNAL," Vol. LXXVII., p. 1299.

THE MANCHESTER ELECTRICAL EXHIBITION.

WITHOUT ceremony, the Manchester Electrical Exhibition opened its doors to the public on Saturday, the 3rd inst., was blessed at the inevitable dinner two days later, and will continue open until the last day of the month, by which time many of the exhibitors' attendants will doubtless be heartily sick of the long hours spent continuously under the light of electric flame arcs and other types of lamps. The exhibition is being held under the patronage of the Institution of Electrical Engineers and the Electrical Manufacturers' Association; and the Electricity Departments of Manchester and Salford have been busying themselves over the show (and quite naturally, as they hope to bag the greatest amount of benefit), while several other electricity-supplying authorities have, so the information runs, "donated" to the laudable object.

It will be remembered that a ready-made building satisfying the organizers of the exhibition could not be found; and therefore a special one has been erected, with a ground area of over 100,000 square feet, in the approved wood-and-stucco style, on a site that is described in the catalogue as being "close to the centre of the town." The tramcars running through Manchester streets are all billed with directions to the visitor as to how to get to the exhibition, so close is it to the "centre of the town." The cars have to be patronized to get to the scene of the exhibition; and the stranger visiting it has abundant time to wonder as he travels along who the party is whose imagination played him such a trick as to lead him to describe the location of the exhibition as "close to the centre of the town." The Palatine Road or Fallowfields cars are the ones to take the visitor to the show. Fallow fields! It is the irony of fate that associates such a name with a boosting demonstration on behalf of electricity. Apparently the display is sadly needed, as in the "Introduction" to the catalogue of exhibits, it is learned that, although the Olympian exhibition was only held in the autumn of 1905, two years later it was felt that the time "had arrived to promote and organize a more comprehensive and complete display of electrical machinery, fittings, &c., than the previous exhibition covered." The introduction is not signed, so that about it things may be left unsaid that might very appropriately be said. The Exhibition at Olympia is described as a "success;" but there has been such a continuous current of murmurings since as to the condition of the electrical industry, that the use of the term will be thought by some folk to be a little wanting in appositeness—especially by those who judge success by the condition of their balance-sheets. Fate is also unkind in another respect. Manchester was fixed upon as a suitable venue, as being the centre of a large and important industrial district; and there synchronizes with the exhibition the blighting influence of a cotton lock-out! When the textile industries are doing well, the managers aver that they cannot for a moment entertain stoppage for the application of electric driving for their factories; when the factories are running on short time, the excuse is that they cannot afford to make a change; and when there is a lock-out, the same managers procrastinate by asserting that they have other matters to monopolize their attention. It is unkind; but the facts remain. Electricians say that the managers do not know their own business, and are blind to their own interests.

These are matters that have incidental bearing on the situation and opportuneness of the exhibition. But to get inside the building. The building itself, although specially erected for the purpose, is in certain respects a failure. It is clearly ill-ventilated. During the hot days at the beginning of the show, the atmosphere by the afternoon and in the evening (though during the day time there were few visitors) was stifling; and it was a relief to go outside for a "breath of fresh air," or to get near one of the working electric blowers. The well-advertised property of electric lighting for keeping the atmosphere of any place comfortable in points of temperature and purity, are not demonstrated here. Again there is no provision for the admission of daylight; and from 10 a.m. to 10 p.m. for a month under the glare of the electric light will provoke among the attendants execration in the heart though position will seal their lips. There is another point about this shutting out of daylight; and it is that in the daytime the exhibition is visited by comparatively few. Most people have other matters to engage their attention during the day; and through the long hours of daylight, hall and stands have to be lighted. The "Electrician" is a little uneasy as to the effects of this exclusion of daylight; and our friends of their editorial staff will "be interested to hear what comments are made by exhibitors on their accounts for energy at the close of the exhibition." Why worry? Is it not written in the electrical literature of the present day that electric lighting, heating, cooking, and power are among the cheapest of the conveniences and utilities in these particular lines? What is cheap for an hour in a day, must be cheap for twelve hours. Then there is another point. The stands are all built in boxlike structures, on the no-connection-with-next-door plan. In some of the rows, the stands are packed together like sardines in a box; and the cramped impression of the place that one gets is accentuated by the narrowness of the aisles, in which if a dozen or so people are gathered together to witness one of the wonders of electricity before a narrow stand, they form an impassable block. We cannot congratulate the exhibition authorities, or the greater number of the exhibitors, on ingenuity in producing attractive novelty in the planning of the stands. Most of the exhibitors (we will not say all) have gone to work as though they wanted to make their display in the cheapest possible manner. Talk about wanting a more comprehensive and complete display than Olympia, why, in—believe us—our unprejudiced opinion, there were several stands at the latter that, in point of effective display, have nothing that can any way compare with them here in Manchester.

However, there are about 250 firms and local authorities directly interested in this exhibition—not, of course, all exhibiting electrical appliances and plant. There is the usual padding—even to a cigarette and tobacco stall, an electric gun shooting range, a type-writing exhibit, &c. Says the catalogue: "Objects of interest will be found appealing not only to the electrical expert and the scientist, but to the man in the street." This is not disputed; but it will quickly get bruited abroad that the "man in the street" can likely get more entertainment for a shilling elsewhere in Manchester than at the Electrical Exhibition. Of course, as the "Electrical Review" points out, it is useless to run an exhibition on such a scale as this unless the right people are got there; and it seems to our kindly disposed, though occasionally covetous, contemporary, that "there might, with profit, have been an elaborate circularizing or canvassing of all power-users other than electrical, accompanied with a free pass into the exhibition; and some attractive publicity literature might also have been circulated among a large number of the gas lighting consumers." Just so; but electric departments of local authorities who also run the gas undertaking must not say or do too much to injure the precious bird that lays the golden eggs, which are disposed of in aid of the rates. If they do, there is sure to be trouble in store for someone. However, the men in the street who do transfer themselves inside the exhibition may, in considering that the exhibition is intended to advertise the excellent qualities of electricity, wonder (in addition to why the atmosphere is stuffy) why a firm should be exhibiting fire extinguishers there, and another showing fire-alarms, which are suggestive that these things will be found highly beneficial for the protection of electricity users. The plentiful employment of wood in partitioning the stands with severe exclusiveness, and the cramped conditions prevailing everywhere, have given some timid ones ground for a little perturbation. The presence of fire extinguishers should, of course, reassure them. While on this point of safety, too—the disposition of electric lighting to fail being publicly well known—it might prevent some disquieting reflections on the part of visitors, if it were prominently announced that the arc lighting of the building is arranged on sixteen circuits, eight of which have been termed "emergency" circuits. And in the event of any failure at the sub-station in the exhibition, an alternative supply to the latter has been provided for from Messrs. Crossley Brothers' exhibit. It will be seen that the utmost possible has been done to obviate trouble from fire and electric failure; but people may regard it as somewhat ominous that there should still be any necessity for including in the "Notices to Visitors" in the catalogue an announcement that "The Management are not Responsible for any Accident which may Happen to any Person at the Exhibition."

The official catalogue is an interesting production, and at sixpence is cheap, regarded from the quantitative point of view. It is rather a pity that the front of the cover should be almost entirely occupied with an advertisement, and that the most prominent type on the whole of this cover front should announce that the advertisers are Mayer and Schmidt, of Offenbach o/Main. British electrical manufacturers have suffered considerably from the foreign invasion of their markets; and there are now several firms with works abroad who are carrying on business through small offices situated in London. So acute has this form of competition now become that many firms are labelling their goods and stating in their advertisements that all their productions are "British Made.' There is no objection to these electrical firms of foreign origin if they come to this country, invest capital and manufacture here, and compete for the trade on level ground. Dipping further into the catalogue, several dogmatic statements which would be very easy of disproof are made in the "Introduction." Among other bold and controvertible assertions is this: "The advent of the metallic filament lamps places electricity easily in the forefront as an illuminating agent, judged from whatever standpoint it may be desired." Then again, speaking of flame arcs, it is said: "The power of the light-giving apparatus of this form of lamp may practically be said to be unlimited; and their efficiency is such that it is rendered difficult—nay, well-nigh impossible—for any other form of illuminant to be compared with them as to cost." The ill-founded assertions are bad enough, but the loose diction—well, we will not hurt anyone's feelings, except to say that educated visitors to the exhibition might be spared annoyance.

Regarding the general lighting of the exhibition. Between the main roadway and the exhibition building, at dusk there is a brave display of illumination, which appears to have a special attraction for a class of people, hanging about the gates and fence, who do not look capable of obtaining illumination a pennyworth at a time, much less by means of flame arcs and incandescent electric lamps. Flame arcs by the Gilbert Company, with incandescent electrics festooned between, illuminate the main roadway; while flame arcs by the British Westinghouse Company are used, together with Cooper-Hewett mercury vapour lamps, for illuminating the elevation of the building. The services of the sun having been dispensed with inside the building, twenty of the General Electric Company's flame arcs and 28 Oliver magazine type flame arcs are used for lighting the main part of the interior. Siemens Bros.' tantalum lamps, Ediswan metal filament lamps, British Westinghouse tungsten lamps, and Sunbeam lamps are used in various minor positions about the place.

Some notes made during an inspection of the exhibits will supply material for a second article. By the day the writer was there, the attendants at the stands had no doubt had time to study thirty-one pieces of advice tendered to them by the "Electrical Review," among which was: "Study the visitor. Don't worry him. But be diplomatic! Don't tell him too much till you are sure of the man and his mission."

(To be concluded.)

GAS FOR THE HOME.

As Seen at Olympia.

At a show possessing such a captivating title as the "Ideal Home Exhibition," one would expect to find gas appliances taking up a large proportion of the space—seeing how greatly the possibilities of present-day domestic comfort are dependent upon them. But while it must be admitted that gas lighting and heating in their various phases are represented at Olympia, the display is not—with the exception of petrol-air gas plants—by any means so complete as might have been the case. The exhibition, which it may be stated was organized by the "Daily Mail," was opened last Friday by the Lord Mayor; and its object is to bring together what is best for the fitting-up of a home. Thus it may be pleaded that the scope is too wide for anything like full treatment of any particular branch, and that a general indication of the lines of modern development is all that could be looked for. Granting this, the exhibition is a good one; and anyone who pays it a visit with an Official Catalogue in his hand will probably find that the only thing which will trouble him at all is the method adopted in numbering the stands, which, on first acquaintance, does not seem calculated to offer any very great assistance to the seeker after the exhibit of one particular firm. This at any rate was the experience of the writer when paying a preliminary visit of inspection last Friday evening; and of that excuse he will avail himself if there be any omissions from the following enumeration of the exhibitors connected with the gas industry.

There are several good displays of gas-fittings, one of which is made by Messrs. A. E. Podmore and Co., of 33, Charles Street, E.C., who show a number of inverted incandescent lamps. Messrs. S. P. Catterson and Son, of Newington Causeway, show inverted and upright incandescent gas-burners, mantles, and fittings of every description suitable for domestic use. The apparatus of Telephos, Limited, of 115, Cannon Street, E.C., for lighting and extinguishing gas at a distance without bye-passes, is so well known to readers that it needs no description. Webb's patent self-intensifying gas-burner and special ramie mantle are shown by the Webb Lamp Company, Limited, of 11, Poultry, E.C.

In the heating section, Messrs. S. Clark and Co., of Highbury, have a large display of their "Syphon" gas-stoves for work-rooms, drawing-rooms, nurseries, lavatories, &c., also a new patent grilling-stove, which can be taken to pieces for cleaning and put

together again within about a minute—there being no screws to remove. There is to be seen a bye-pass light on a flexible tube, connected with the supply-pipe of the stove, so as to form a convenient method of lighting the different burners of the stove when required. Mr. Thomas Potterton, of Balham, has, among other things, a combined coal and gas burning range, called the "Queen," with coal or gas heated boilers. The transformation from coal to gas, or *vice versâ* can be almost instantaneously effected. Numerous samples are on view of the "Victor" gas-boiler, which is supplied through the London Gas Companies. Messrs. Tilley Bros., of 53, Kingsland Road, N., have a "Hot Ray" gas-fire fitted into an ordinary grate, and a "Hot Ray" gas basket fire placed in a recess from which the coal-fireplace has been removed. A six-burner fire, with gas at 2 inches pressure, is said to consume only 22 cubic feet per hour; and it undoubtedly has a very comfortable appearance. On the sides of the stand there are some pretty gas-brackets.

The London Anti-Vibration Incandescent Fittings Company (Messrs. Holbrook and Co.), of 39, Foster Lane, E.C., show the "Radi-hot-o" heater, which is made of wrought iron, and is very quickly heated. Being light and portable, it can be moved as desired. The time to heat up is given as one minute; and it can be quickly attached by a flexible tube to any burner. The heater is a cheap one; and one of its features is that the burner can, for lighting, be pulled out in order to avoid explosion. The "Eureka" incandescent burner, and the "Huprite" patent mantle rod are also to be seen here. Messrs. C. Toope and Son, of Stepney, are makers of gas and other apparatus for heating conservatories and greenhouses. Another very substantial combined coal and gas range is to be found at the stall of the Standard Range and Foundry Company, Limited, of Watford; while Messrs. Clotten and Co., of 305, Oxford Street, have some handsome "X-Rays" gas-stoves, which are made in a large number of different sizes and models to suit all requirements. There are also gas-heated geysers, &c. A cheap portable oven for roasting or baking is shown by the Quick Cooker, Limited, of 118, Holborn, E.C.; and the Harris Patent Grill, of 40, Knightsbridge, S.W., does not require further introduction to "Journal" readers. The "Comet" gas-heater (of the Comet Speciality Company, Leicester) is an apparatus which can be instantly attached to any gas-bracket. Appliances for heating water, &c., by gas are shown by Messrs. Ellkay and Co., of Upper Thames Street. Gas cooking-stoves pure and simple seem, it is sad to report, to be conspicuous by their absence.

As already remarked, petrol-air gas is very fully represented; there being something like a dozen of these plants at least. The Bens Gas Company, Limited, of Chichester, have erected a model house which is lighted and heated by their petrol gas, which, it is claimed, costs about 2d. per 1000-candle power per hour; while it is non-poisonous and non-explosive. A *chef* will be in attendance in the kitchen cooking food, so that visitors may assure themselves that the food has no flavour of the gas. The gas contains practically the whole of the air needed for its combustion. The Centenary Gas Company, of 11, Queen Victoria Street, E.C., draw attention to their system of manufacturing petrol air gas of a non-explosive character, suitable for lighting, heating, and cooking, and which it is said can be stored and conveyed through miles of pipes, in all weathers, without any condensation. A gallon of petrol yields 1000 cubic feet of the gas; the cost being put at a little over 1d. per hour per 1000-candle power. Other petrol-air gas plants are shown by Cox's Air Gas Company, of Kentish Town Road, N.W., whose system was fully described in the "Journal" on Sept. 29; Safety Light, Limited (De Laitte and Elwell-Smith patents), of 117, Middlesex Street, E.C.; the Pittner Invetrol Light Company, of 38, Bedford Court Mansions, W.; Messrs. Thomas Broad, Limited, of Great Malvern, the "Litz" system of gas production, the cost of which is given at 1½d. per 1000-candle power per hour; the "Loco" Vapour-Gas Light Gompany, Limited, of Manchester, who place the cost at 1¾d. for the same amount of light; Mr. E. G. Mitchell, of Ely Place, E.C., the "Mitchelite" system, which has already been described in the "Journal;" the National Air Gas Com-Company, Limited, of New Cross, who, with petrol at 1s. 1d. per gallon, make their cost out to be 0·8d. per 1000-candle power per hour, *plus* the cost of supply to the engine burner; the Praed Patent Safety Gaslight Company, Limited, 20, Victoria Street, S.W.; and Messrs. Strode and Co., of 48, Osnaburgh Street, N.W., whose Aerogen gas-generator has now been on the market for many years past.

Acetylene lighting with or without mantles is dealt with by the Allen Company, of 106, Victoria Street, S.W., and the Rural Districts Gaslight Company, Limited, 28, Victoria Street, S.W. Many of the acetylene and other fittings of Messrs. Strode and Co. are of most handsome design.

Gas-Works Directory and Statistics for 1908-9.—We have received from Messrs. Hazell, Watson, and Viney, Limited, the latest edition of their well-known directory. It is the thirty-first issue; and it is stated on the title-pages that the contents have been revised to July last. Lists are given of the chairmen and officials of the undertakings of which statistical particulars are furnished, as well as of the English and Foreign Associations of Engineers and Managers. The book is bound in brown cloth; and the price is 10s. 6d. net.

TECHNICAL METHODS OF CHEMICAL ANALYSIS.

II.

Last week (p. 31) we discussed the contents of the first part of Vol. I. of Professor Lunge's comprehensive work on this subject. Part II. (which is bound separately) opens with a section on "Potassium Salts," which naturally has no special reference to the gas industry. The next section is on "Cyanogen Compounds," and is by Dr. H. Freudenberg, the Chemist at the German Gold and Silver Separating Works, Frankfort. The translation and revision have been carried out by Dr. J. T. Conroy, B.Sc. The ordinary methods of analysis for simple cyanides are first given. Then follow methods for the estimation of double cyanides, of which the ferrocyanides of the alkali metals are, of course, of most importance. Knublauch's method for the determination of the "blue" present in spent oxide is given, together with the later methods of Moldenhauer and Leybold, and of Drehschmidt, with its modifications by Burschell and Lubberger, which have been described fully in the "Journal" from time to time. So far as the sludge from the wet processes for the extraction of cyanogen is concerned, the analytical methods described are those adopted by the "Residua" Works, which collects and works up the bulk of the sludge produced in German gas-works under Bueb's process of extraction. Reference is made in connection with the analysis of commercial potassium cyanide to the practice of returning all the cyanide present as in the form of potassium cyanide, which, when (as is frequently the case) there is present an appreciable amount of sodium cyanide, may result in the percentage of potassium cyanide returned exceeding 100. It is suggested—and the suggestion is obviously one that should be generally adopted—that it would be better in the case of the analysis of high-quality potassium cyanide to return the cyanogen contents as such, and not in terms of the equivalent quantity of potassium cyanide. There is, indeed, no reason why the suggestion should not be extended to even the lower grades of potassium cyanide.

The next section—that by Dr. P. Kreiling, of Berlin—deals with "Clay," and has been translated and revised by Mr. W. Burton, Director of a Tile and Pottery Works in Lancashire. There is not a great deal of interest to gas engineers in either this or the companion section, on "Clay Wares used for Building Purposes, Earthenware, and Glazes," by Herr K. Dümmler, of Charlottenburg, which also has passed through Mr. Burton's hands for translation and revision. We should have written otherwise of these sections had there been any attempt to deal adequately with the quality and analysis of highly refractory bricks and cements; but beyond a few lines on fire-resisting qualities, there is really nothing in regard to the study of the firebricks which are so largely used in furnace construction on gas-works. We cannot trace that they are being dealt with in any other part of the work. The omission is a serious one.

The following section, by Professor Lunge, treats of "Aluminium Salts and Alumina," and, like the next section, on "Glass," by Professor E. Adam, of Vienna, is only quite indirectly of concern to readers of the "Journal." Some interesting information may, however, be gleaned as to the composition and properties of the more refractory glasses which are now employed in the manufacture of chimneys and globes for gas-burners. The next section is on "Calcareous Cements;" and the author is Dr. Carl Schoch, of the Royal Technical High School at Berlin. A great part of this section is taken up with a reproduction of the British standard specification for portland cement issued by the Engineering Standards Committee in 1907. In the early part of this section—dealing with the determination of calcium carbonate by means of the carbonic acid evolved on its decomposition—there is some overlapping and a certain amount of contradiction of that part of the opening section of the work dealing with gas volumetric analysis. The calcimeter in various forms is described, and Mohr's apparatus for the determination of the carbonic acid by loss of weight, which is of a class which was said in the earlier section (*ante*, p. 31) never to give correct results, is now described. We regretted the absence from the earlier section of a description of a gravimetric absorption method of estimating carbonic acid from carbonates; in the present section we find justification for our regret in the following words: "For the exact analysis, the determination of the carbon dioxide should certainly be carried out by the gravimetric method of Fresenius-Classen . . ." Nevertheless, the method is not given. The important structural material, portland cement, is somewhat scantily dealt with apart from the reproduction of the British standard specification; and it appears as though recent English work—such as the long communication made to the "Society of Chemical Industry" by Mr. Bertram Blount in 1906—has been overlooked in the revision of this portion.

The next three sections may be discussed together, as the topics with which they deal are so closely allied that it would in many respects have been an advantage if they had been entrusted to a single author. As it is, there is a good deal of overlapping. The first of the three is on "Drinking Water and Water Supplies," and has for its author Professor L. W. Winkler, Ph.D., of Budapest, and for translator and reviser, Dr. G. J. Fowler, of Manchester. The second is on "Feed Water for Boilers and Water for other Technical Purposes" by Professor Lunge, who does not, of course, require the aid of a translator. The third—on

"Sewage and Effluents"—is by Dr. E. Haselhoff, of Marburg, and has the same translator and reviser as the first of the three. These sections, as a whole, are excellent. The disadvantages of the triple authorship are shown, however, by the fact that for the determination of the residue on evaporation, or total solids in the water, Professor Winkler directs that the portion taken should be evaporated on a water-bath and the residue dried for three hours in an air-oven at 100° C. before weighing; while Dr. Haselhoff recommends evaporation and drying for one hour in an oven at from 105° to 110° C. Professor Winkler rightly points out that results are not comparable unless the residue is always dried at the same temperature; and it seems a pity that the two authors whose directions appear within a few pages of one another did not come to an understanding to prescribe the same temperature for the drying. Actually 105° to 110° is preferable, and is generally adopted in technical laboratories in this country. We note with satisfaction that the erroneous conclusions which are liable to be drawn from purely bacteriological investigations of drinking water are plainly pointed out.

A short section, on "Soils," follows, by Dr. E. Haselhoff, with Mr. A. D. Hall, M.A., of the Rothamsted Experimental Station as translator and reviser. This is followed by the final section of the volume, by Professor K. B. Lehmann, Ph.D., of Würzburg, on "Air," translated and revised by Dr. Charles A. Keane, M.Sc. The apparatus devised by Dr. J. S. Haldane for the rapid determination of carbonic acid in air, which is now so extensively used in this country, is described. In regard to the determination of the moisture content of the air, which appears to have proved a matter of such difficulty in connection with the photometric work carried out at the National Physical Laboratory (see "JOURNAL," Vol. CIII., pp. 713, 766), we find that the gravimetric method is described, but without the details which are absolutely essential for securing correct results. A simple improvement on the ordinary psychrometer is mentioned; but there is nothing about the Assmann apparatus, of the superiority of which the National Physical Laboratory has lately become convinced. As a fact, however, we have never seen the Assmann psychrometer mentioned in an English or French text-book; and we are quite at a loss to understand on what grounds it is now proposed to give it official recognition. The estimation of occasional impurities in air is fairly exhaustively handled; much of the information given being drawn from the valuable text-book on "The Investigation of Mine Air" by the late Sir Clement Le Neve Foster and Dr. J. S. Haldane. It is satisfactory to close the volume before us with a feeling that the last section shows no falling away from the high standard of merit of the earlier sections.

The volume concludes with an Appendix, in which are reproduced (for convenience of reference) all the tables included in the text, alongside a few others of general utility. We are pleased to say in conclusion that the merits of the work far outweigh the few demerits which, for reasons already stated, it has seemed desirable to indicate in these remarks.

TECHNOLOGY OF DESSAU VERTICAL RETORTS.

V.

By THOMAS HOLGATE, M.Inst.C.E., F.C.S.

THE elements contained in the operating of a vertical gas-retort must be clearly distinguished, because only in this way can it be known whether the vertical type is intrinsically better in distillation, or only incidentally as a convenient means of generating water gas. The presence of water gas may not be desired, or, if required, may be more advantageously obtained in a separate plant. Having once ascertained the possibilities of the vertical retort in this direction, then it becomes a matter for consideration for each definite instance which method is best suited and most economical. Further, the incidence of steaming is different in the intermittent to the continuous vertical, as in the former it is restricted to the terminal period after the distillation has been almost completed; while in the latter, as devised by Messrs. Woodall and Duckham (with the exception of the installation at Poole), it has been admitted continuously. While treatment with steam in the former may be advantageous, it does not follow that the admission of steam to the latter will be equally beneficial. If we may judge from the figures furnished by Mr. Harold Woodall as to trial runs with the Poole retort, from which steam is practically excluded, it would appear that the results eclipsed those at Nine Elms, where steam was of necessity admitted, and the magnitude of which was beyond control.

Differentiating therefore the carbonization proper from the auxiliary water-gas production, it becomes necessary to see how the Dessau retort compares with the best work in horizontal retorts. Such a comparison is not so easy as would appear at first sight, for to make it satisfactorily the same class of coal ought to be carbonized in the two forms of retort, over a period sufficiently long to give a true average. Of such a course of working, we have no detailed information; and therefore we are thrown back upon the existing data for horizontal working, and must use this as a relative standard whereby to judge the merits of carbonizing with the retort full and that retort vertical. That there is need of such an inquiry may be seen by comparing the gross calorific power of the gas from one ton of coal carbonized in the several ways we have just referred to. The need is accentuated when the illuminating power results are included.

TABLE XXI.—*No Steam Admitted.*

—	Gross Calorific Power per Ton of Coal.	Tested With No. 1 "London" Argand.	Candles per Ton, Tested with No. 2 "Metropolitan" Burner.
Mariendorf vertical	6,669,000	..	36,252
Dessau vertical	6,799,310	..	37,049
Zurich vertical	7,198,380	(flat flame	22,192)
Nottingham horizontal	7,734,881	37,460	..
Poole vertical	7,807,748	..	40,398

TABLE XXII.—*Steam Admitted.*

—	B.Th.U. Gross per Ton of Coal Carbonized.	Candles per Ton, Tested with No. 2 "Metropolitan" Burner.
Dessau vertical	6,957,387	35,904
Nine Elms vertical	7,411,562	39,306
Mariendorf vertical	7,415,970	33,586
Zurich vertical	7,753,020	flat flame 17,220

In Table XXI., we see how far the carbonizing at a bright orange heat in a horizontal retort, as carried out in the tests by Mr. Lewis T. Wright, may be regarded as a standard by which to gauge present achievements. The return from the Poole retort is in illuminating power apparently better, but how much must remain in doubt, because although the illuminating power of the gas made at Nottingham was tested with the chimney full of flame, it can hardly have shown so well as it would have done with a No. 2 "Metropolitan" burner.

If it be permissible to reckon 15·6 candles, as it then tested, as equal to 17 candles in a No. 2 burner, then the figure of 37,460 becomes $\frac{12{,}006 \times 17}{5} = 40{,}820$ candles per ton of coal. That some such allowance must be made will be readily admitted; and, if so, then it may be said that the highest return from a vertical retort, not using steam, both as to calorific and illuminating power—viz., that from Poole—is about equal to the one for the horizontal, chosen as a good representative of normal methods. This choice has been made because of the relative amplitude of the information accompanying the Nottingham test. It must, of course, be remembered that it does not represent a period of continuous or large-scale working, but that of a carefully arranged test. All the same, it furnishes a criterion by which we may see whether we are getting any real advantage by adopting another *modus operandi*.

In Tables XIV. to XVI. (see "JOURNAL," Vol. CIII., p. 841), it was shown, by taking in detail each constituent, that the superiority of the Nine Elms figures over those of Dessau when steaming, were due to an increased content of methane. The comparison was made because the amount of water gas in each case was probably not very divergent. But now, in making a comparison with horizontal retort working, the figures for non-steaming work in the vertical retort must be employed. These can be compared with Tables XV. and XVI. (see "JOURNAL," Vol. CIII., pp. 841), and thus an all-round comparison secured.

Table XXIII., line 3, shows, when compared with Table XV., for the gas made at Nine Elms, that the latter excels in methane, although it loses almost as much heating power in the unsaturated hydrocarbons. The hydrogen figures are very nearly equal. The heat of combustion of the gas made at Nottingham is not recorded; but the completeness of the analysis, which includes the carbon density and the hydrogen density of the unsaturated hydrocarbons, has enabled the calorific power to be calculated without much risk of error in the upward direction. In the ethylene and benzene series, each atom of carbon per cubic foot of gas corresponds with about 492 B.Th.U., in addition to that allotted to hydrogen—regarding the latter as in the free state. The acetylene series would have furnished a higher figure for carbon, but in the Table XXIII. the lowest permissible figures have been taken for the calorific powers—viz., 2280 B.Th.U. gross and 2118 B.Th.U. net.

On line 3, the Dessau coal gas is seen to be lower in methane than that at Nottingham, and very much lower than Nine Elms, as shown in Table XV. (see "JOURNAL," Vol. CIII., p. 841). In unsaturated hydrocarbons it has 746,000 B.Th.U., and is thus intermediate between Nottingham, which has 1234 thousands, and Nine Elms, which has only 478 thousands. Other differences are notable in the hydrogen and carbon monoxide; but the hydrocarbons saturated and unsaturated are as shown in Table XXV. It is quite clear from the last column of this table that the hydrocarbons as a whole have to do with two-thirds the heating power of the gas mixture, even where high heats have been employed and where consideration of the illuminating power has not been allowed to fetter the course of action.

The tests in the three cases just compared were all upon English coal—the first being Midland, the second Durham, and the third a mixed sample of stored coal. These differences of origin and condition must have due weight in forming a judgment upon the above figures; but it would appear from them that

TABLE XXIII.—*The Calorific Power of Gas from a Ton of Coal Carbonized at Bright Orange Heat, Nottingham.*

Name of Constituent.	Cubic Feet per Ton of Coal.	Gross Calorific Power.		Net Calorific Power.		Difference.		Line No.
		Per Cubic Foot.	Per Ton of Coal Carbonized.	Per Cubic Foot.	Per Ton of Coal Carbonized.	Per Cubic Foot.	Per Ton of Coal Carbonized.	
Carbon monoxide . . . . (CO)	1,676·0	342	573,192	342	573,192	*Nil*	*Nil*	1
Hydrogen. . . . . (H_2)	5,765·3	344	1,983,263	288	1,660,406	56	322,857	2
Methane . . . . . (CH_4)	3,685·8	1070	3,943,806	958	3,530,996	112	412,810	3
Simple combustibles	11,127·1	584·19	6,500,261	518·07	5,764,594	66·12	735,667	4
Complex do. . . $C_{2\cdot63}H_{5\cdot76}$	541·5	2280	1,234,620	2118	1,146,897	162	87,723	5
Total combustibles	11,668·6	662·88	7,734,881	592·31	6,911,491	70·57	823,390	6
Non-combustibles	337·4	..	..	..	..	..	..	7
Observed values	12,006·0	644·25	7,734,881	575·67	6,911,491	68 58	823,390	8

TABLE XXIV.—*The Calorific Power of Gas from a Ton of Coal in Dessau Retorts (First and Third Day's Tests) Without Steam.*

Constituent.	Cubic Feet per Ton of Coal.	Gross Calorific Power.		Net Calorific Power.		Difference.		Line No.
		Per Cubic Foot.	Per Ton of Coal.	Per Cubic Foot.	Per Ton of Coal.	Per Cubic Foot.	Per Ton of Coal.	
Carbon monoxide . . . . (CO)	633·88	342	216,787	342	216,787	*Nil*	*Nil*	1
Hydrogen . . . . . (H_2)	6,465·14	344	2,224,008	288	1,861,960	56	362,048	2
Methane . . . . . (CH_4)	3,376·01	1070	3,612,331	958	3,234,218	112	378,113	3
Simple combustibles	10,475·03	577·86	6,053,126	507·2	5,312,965	70·66 Negative	740,161 Negative	4
Complex do. . . (C_nH_m)	326·85	2283	746,184	2413·5	788,850	130·5	42,666	5
Total combustibles	10,801·88	629·45	6,799,310	564·88	6,101,815	64·57	697,495	6
Non-combustibles	457·12	..	..	..	..	..	..	7
Observed values	11,259·00	603·9	6,799,310	541·95	6,101,815	61·95	697,495	8

TABLE XXV.—*Gross Calorific Power per Ton of Coal—B.Th.U.*

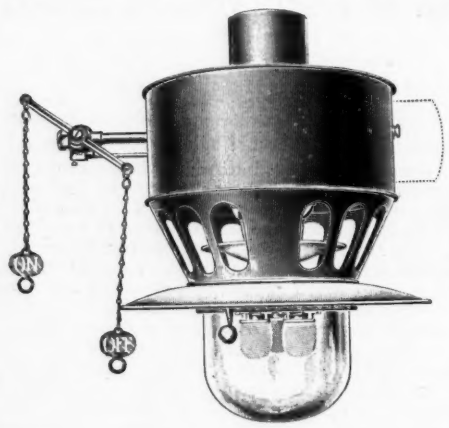
—	From Methane and other Saturated Hydrocarbons.	From Unsaturated Hydrocarbons.	Total from Hydrocarbons.	Per Cent. of Total Heating Power.
Nottingham horizontal retorts	3,943,806	1,234,620	5,178,426	67
Dessau verticals, coal gas only	3,612,331	746,184	4,358,515	64
Nine Elms verticals, including some water gas . .	4,659,058	478,277	5,137,335	69·3

the advantages of vertical retorts are not inherent in any radical superiority so far attained over distillation in horizontal retorts at high temperatures. Such a statement does not mean that the opportunity for improvement does not exist, but rather that the results in total hydrocarbons of Nine Elms being so near that of Nottingham, and the figures for the Poole retort as to the total gases being in excess of Nine Elms, there is a reasonable prospect that, by a continuous method, horizontal retort working as hitherto practised may be eclipsed. There is a view, often hinted at rather than clearly expressed, that the day is past for paying any attention to the presence of hydrocarbons in lighting gas, inasmuch as only heating power need be considered for the incandescent burner. All experience points towards the best results being obtained with gas of high calorific power, and that probably high flame temperature goes with high calorific power. Whether or not this is always so is perhaps, in this connection, not of vital importance, but rather to know the actual temperature—obtained by pyrometric measurement, and not by doubtful computation—which any gas will yield when burnt in the bunsen flame. Professor Fritz Haber has investigated the complicated changes which occur in the inner and outer cones of the bunsen flame and the temperatures which result therefrom; and he states that with illuminating gas he obtained temperatures of 1386°, 1508° to 1510°, and 1525° C., while with benzene he got about 2000° C., and with illuminating gas containing carbon dioxide he obtained 1255° C., 1265° C., 1305° C. to 1324° C., and 1370° C. How much carbon dioxide was present is not made clear; but it is perhaps not unreasonable to regard Professor Haber's data somewhat in the following light: (1) That the presence of benzene, which may be regarded as the highest member of the so-called unsaturated hydrocarbons usually present in coal gas, tends to increase flame temperature. (2) That the presence therein of carbon dioxide lowers flame temperature.

Knowing as we do that the radiation of light increases as the fourth power of the temperature, it is manifestly of great importance that the temperature of the flame be maintained as high as possible. What, then, is the ideal gas that we ought to aim at producing? The only way to answer the question fully is, of course, to ascertain carefully the quantity and the quality of the gas produced, and then burn it, if need be, with a measured supply of air in a suitable bunsen burner, yielding a flame that shall fit a mantle of known composition and properties. Then we shall doubtless be on the road that will lead us to some definite information as to what is the sort of gas we ought to supply for light, heat, and power. As soon as this is clearly ascertained, the most profitable mode of manufacture would probably not be difficult of attainment, if we may judge by the large accessions to our knowledge furnished by the tests made during the past twelve months at home and on the Continent.

A LAMP FOR FLORISTS, ETC.

WE have received from Messrs. J. & W. B. Smith, of Farringdon Road, E.C., the accompanying illustration of a lamp which is specially suitable for florists, and all places where it is absolutely necessary to keep the atmosphere pure. This indoor "Silva" lamp is provided with a special ventilating hood, by



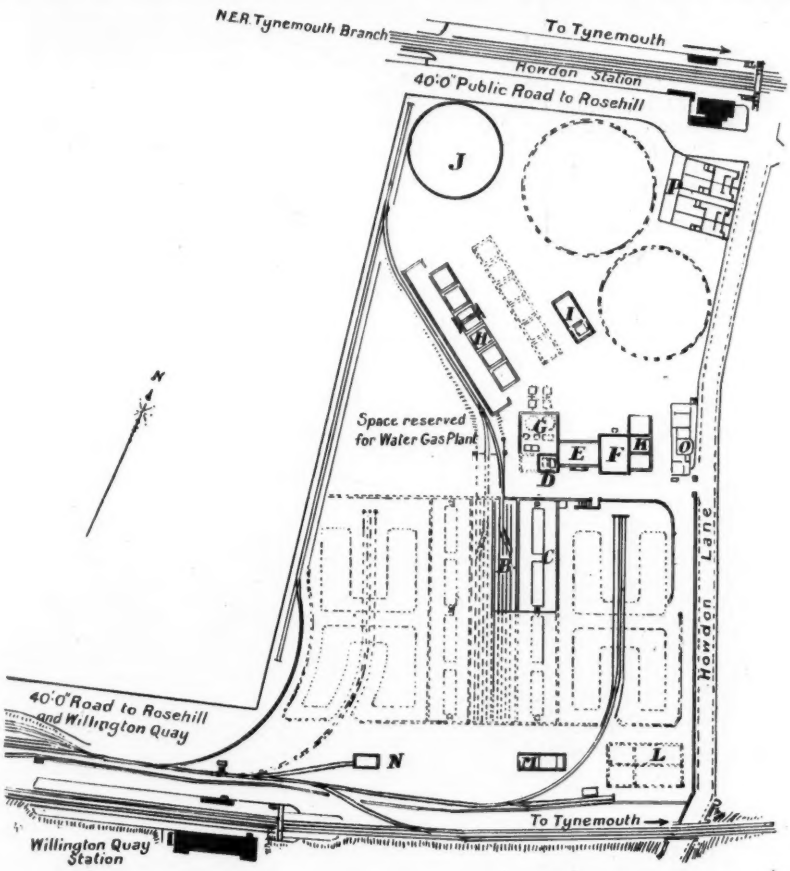
means of which the products of combustion are directed away from the side or by the top. It also embodies a special flash bye-pass; and the lever-cock is brought out at the side of the lamp. The construction is extremely simple and satisfactory.

Gas Companies' Protection Association.—We learn from the Secretary (Mr. F. E. Cooper) that the eleventh annual meeting of the Association will be held at the Westminster Palace Hotel on the 21st inst. The meeting will possess melancholy interest in consequence of the death of Sir George Livesey, the first Chairman, and subsequently the Vice-President, of the Association. The general business will include the presentation of the annual report and accounts and the election of seven gentlemen to serve upon the Committee—six in place of those retiring, and one in succession to Mr. H. B. Chamberlain deceased. All the outgoing members of the Committee, with the exception of Mr. William King, of Liverpool, offer themselves for re-election.

THE NEW GAS-WORKS OF THE WALKER AND WALLSEND UNION GAS COMPANY.

THE now familiar tale comes to us from Walker and Wallsend, of the gas business outstripping the utmost capacity of the old works. Events frequently cast their shadows before; and the shadowy sign of the fact that the Walker and Wallsend Union Gas Company would before long be developing a new manufacturing centre was given to us when, in the session of Parliament of 1905, they, on the advice of their Engineer and Manager (Mr. A. B. Walker), were promoting a Bill, and obtained for it Royal Assent, for constructing a complete new works on an altogether fresh site. The gas business in their district had shown a remarkable cumulative power prior to that period; and the continuity of that happy state of affairs was also evident, excepting those periods that are unavoidable when industrial depression in the North sets in, and disturbs the path along which progress proceeds. The Company occupy an area in the great district of which Newcastle is the centre—a district in which all industrial operations are conducted on mammoth scale; and, this being so, the fluctuations from and to prosperity and depression are naturally at times somewhat violent. But the duty of the Company is to keep themselves abreast of demand in the most favoured years for the district's industry. Hence the provision of 1905 for new works; hence too the completion of the first section of the new works, which were opened last Friday, and which a representative of the "JOURNAL" had an opportunity of inspecting earlier in the week. But apart from the periodical rises and falls of business traceable entirely to industrial causes, what may be termed the normal level of the Company's business has exhibited a somewhat extraordinary ascent, as was shown by some figures given us by Mr. C. H. Armstrong, the Company's Secretary. Mr. Walker entered upon his present appointment in 1895; and, in that year, the consumption of gas all told was 120 million cubic feet. Last year the consumption was 310 million cubic feet, which is, generally speaking, a singular development for twelve years. The price of gas in 1895 was 2s. 10d. per 1000 cubic feet; the lowest ordinary price for a period since has been 2s. 3d., less 25 per cent. for power. When at this last-named price, in 1906, the average payment per 1000 cubic feet for gas sold was only 2s. 0·698d. In 1907, the price was practically the same.

In such facts as these is seen the reason for new producing and storage works. The Company, acting under the advice of their



A. Railway sidings.
B. Coal-store.
C. Retort house.
D. Condensers.
E. Exhauster house.
F. Boiler house.
G. Washers and scrubbers.
H. Purifiers.
I. Station meter and governors.
J. Gasholder.
K. Workshops and stores.
L. Tar and liquor wells.
M. Sulphate house.
N. Locomotive house.
O. Offices.
P. Foremen's cottages.

A. B. WALKER, Engineer.

Plan of the Howdon Lane Works of the Walker and Wallsend Union Gas Company.

Engineer (from whose plans, and under whose supervision, the new works have been wholly built), acquired a site for the purpose, comprehending some 12½ acres, at the easternmost part of the Wallsend district; and the thoroughfare by which the site is approached and bounded on one side—Howdon Lane—will give to the new works its name. It must be noticed as an important factor in the selection of site that it is very conveniently situated for railway and river communication. The very first thing that had to be done, when the parliamentary powers were secured and the site was in possession, was to amplify the Company's storage capacity. This was imperative. The gasholder storage was in 1905 only half the maximum daily output—that is to say, the relations of storage to output were then as 750,000 cubic feet is to 1,500,000 cubic feet. So it came to pass that a holder was put in hand; the first sod in connection with the work being cut on Nov. 1, 1905, by the Chairman, Mr. Thomas Crawford, J.P. There was no time to be lost; and on the following day, the tank contractor, Mr. W. T. Weir, of Howdon-on-Tyne, started the work. The progress he made enabled the holder contractors, Messrs. Clayton, Sons, and Co., of Leeds, to early put in hand their part of the work, and to deliver over the holder complete for use the following September. The holder has an available capacity of 1 million cubic feet. It is a good piece of work; and the open lattice columns and red coloured paint (supplied by Messrs. John E. Williams and Co.) give it a light appearance.

The erection of the gasholder is mentioned first because it ante-dated the commencement of the ordinary development of the site. July, 1906, witnessed the putting in hand of this work; and on May 28 of this year gas was first produced. Nature does not often provide a site that, in its levels and position, is adaptable to gas-works purposes without entailing some labour. In this case, the site had water and railway facilities; but the inclination of the land was such that a large amount of excavation work has had to be done—practically for the whole of the buildings; and the unequal levels of the portion of the site assigned to the coke yard has had to be straightened by levelling-up, and the same at the lowest part of the dip of the land where the tar and liquor tanks are situated. These are 90 feet long by 30 feet wide and 16 feet deep; and for them the walls were simply built up and the spoil tipped round about them. It is interesting to note that the whole of the development of the land and the construction of the various buildings, retaining-walls, and roadways were carried out by the Company's own workmen. The plan shows the general arrangement of the works, which are designed for a production of 6 million cubic feet per day; the plant being divided into two sections of 3 million cubic feet each per day. The plant already

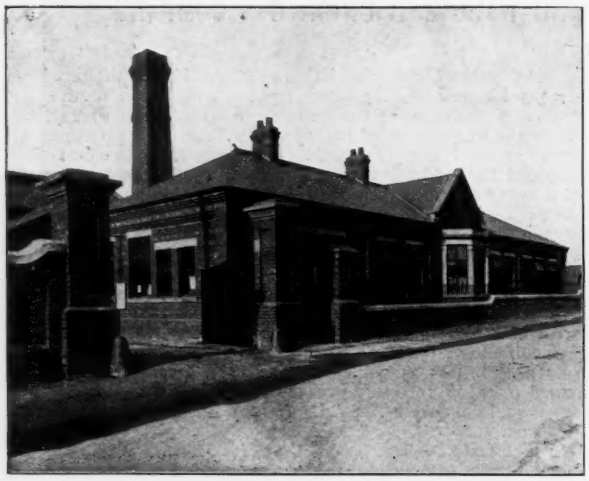


Fig. 1.—Entrance Gate and Offices.

erected is depicted upon the plan in full lines, while the projected developments are marked in dotted lines.

There is one other general feature to be noted before entering upon a description of the new works part by part. Architecturally, the buildings are uniform in style. They are of red brick, built in Potter's red cement—a local production. The roofs are of steel, and slated; and the whole of the buildings are fire-proof. We must compliment Mr. Walker upon both the design and the disposition of the plant, which provides for future extensions on economical lines, permits the operations of manufacture from material entrance to product exit to be performed economically and expeditiously, and also allows ample space about the works for ordinary locomotion and freedom of procedure whatever may be in hand. There is no worse enemy of the gas engineer than a cramped works; and there will be nothing in the nature of objectionable "tight-lacing" for the engineer on this site now or henceforth, unless the whole of the present plans and buildings are sacrificed, which is about the most improbable of all conceivable happenings.

The Railway Sidings.

As the work of development proceeded, the railway sidings were laid down to facilitate the delivery of the material. In all, the works' sidings, measured as single track, have a length of 1500 yards. Connection is made to the North-Eastern Railway Company's Riverside line immediately adjoining Willington Quay station. The arrangements are such that material can be delivered into the sidings either from the up or down lines; there being connections at the east and west side of the station platform. The whole of the embankment and the marshalling yard was made up from the spoil dug from the site of the retort-house. Close to the marshalling yard is a truck weighing-machine (made by the Whessoe Foundry Company, of Darlington) capable of weighing up to 60 tons. The special building in which this is housed serves to accommodate a 20-ton cart weighing-machine for weighing coke and material to be taken to the river side for shipment.

Dealing, however, with the coal first. After it has been weighed, the trucks are drawn by the Company's own locomotive (which was busily at work performing this duty at the time of the visit), up an incline to the north part of the site, which is about 33 feet above the level of the sidings. A point of interest was observed in that the locomotive is named after the Chairman of the Company—Colonel Crawford. At the most northernly point, the line branches off to the

Coal-Store.

This runs the length of the retort-house on the charging side, and is 169 feet long by 30 feet wide, and has a depth of 18 feet below the elevated floor along which the railway waggons run, thus giving a storage capacity of 2000 tons. But ultimately, when extension is necessitated, the capacity will be duplicated. From

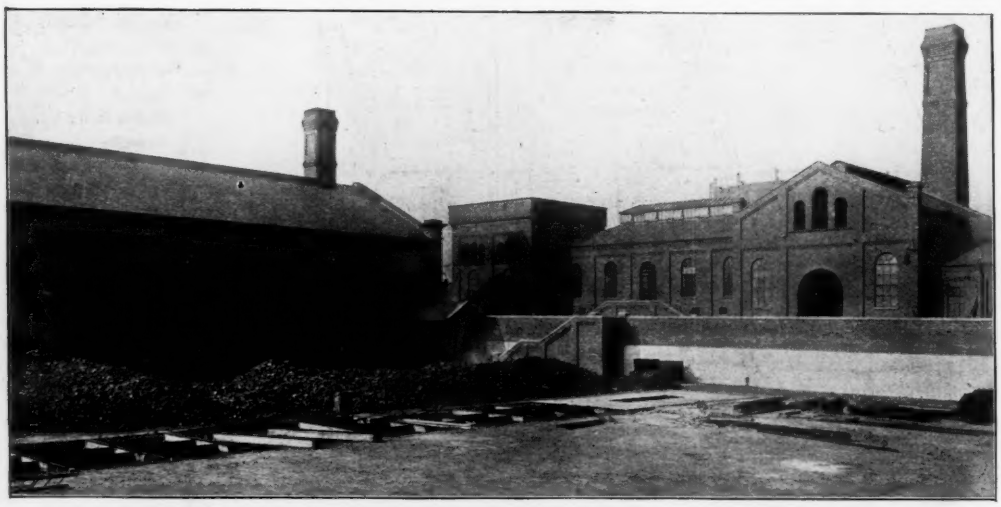


Fig. 2.—General View of the Retort, Condenser, Exhauster, and Boiler Houses, and Coke Yard—Showing the Cover over the Coke-Loading Dock under Construction.

the exterior bank-elevated single railway line, there is a bifurcation of the rails in the store, so that the trucks and deliveries can be dealt with at pleasure. The stores have been designed for the use of high-capacity waggons; and at the time of inspection, some 23-ton trucks of the hopper-bottomed type were being discharged.

Here we have, in connection with these coal-stores, what may be described as a novelty so far as a large range of works' inspections enables us to speak with assurance. This is what is termed an "operating chamber," situated on the side of the retort-house, centrally within the length of the coal-stores. The coal, as far as is permissible, is tipped round about this operating chamber, so that it travels by gravity through sliding doors in the bottom side parts of the chamber as required and is not again touched by hand until it is dealt with as coke later on; and ere long the coke too will be dispatched without any manual labour. Now at the bottom of this operating chamber are the coal-breaker and the boot of the coal-elevator. Stepping from the platform of the coal-store through a doorway, we at once come on to a platform in the centre of which is the coal-elevator head; and looking round it is seen that from this platform there is access to all parts of the push-plate conveyor leading over the continuous coal-hopper, and to every part of the tops of the retort-benches. Bearings and the possible seats of trouble are all subject to free examination. It is indeed a feature in Mr. Walker's design, that he believes in the provision of ready and safe access to all portions of his working plant. But from the platform where the head of the elevator rises, descent is made to a platform where there is an operator who has before him hand-wheels for operating on three sides of the chamber sliding-doors through which the feeding hopper of the breaker is fed. In this way, providing regular deliveries of coal are received and tipped alongside the operating chamber, no trimming is needed, while there is a thorough mixture of the different coals. The only men required to deal with the coal are a locomotive man, the operator in the chamber, and the man attending to the conveyors over the hoppers.

Inside the Retort-House.

The coal-breaker and the elevator are driven by a gas-engine placed under the coal-stores. But ascending to the elevator head again, it is noticed that the coal-conveyors over the continuous hoppers are driven by electric motors. The whole of the coal plant is capable of dealing with 30 tons per hour. The hoppers have a total storage capacity of 150 tons.

The section of the retort-house at present constructed measures 169 ft. long by 60 ft. wide; and its height to the eaves is 30 ft., and to the apex of the roof 50 ft. Centrally down the house are two retort-benches in line, each bench containing six arches of eight horizontal retorts, 22 in. by 16 in. by 20 ft. long—that is to say, in all 96 retorts, or 192 mouthpieces. The house has a temporarily

filled-in gable and end, so that it can be easily extended, and the benches continued in line as necessity demands. The settings are, of course, on the regenerative system, and are worked by a new charging machine and pusher, about which we must wait for further particulars until there has been a full and fair trial under working conditions. About the retort-bench ironwork, there is nothing that requires mention. It was noticed that retort-governors are used; and in the passage between the two benches tar-towers are situated, and they are arranged in such a way that it is quite impossible to unseal the dip-pipes. Mr. Walker believes in the modern system of heavy charges; and he is putting into each retort 10 to 10½ cwt. of Durham second-class coal, with eight-hour carbonizing periods. It was noticed that at the present time only six of the arches have been completed; the other six being now ready for their mountings. The house is well lighted and ventilated; and on the side where the coke is discharged, an ample number of openings have been left in the wall of the building, to give easy access to the coke-yard.

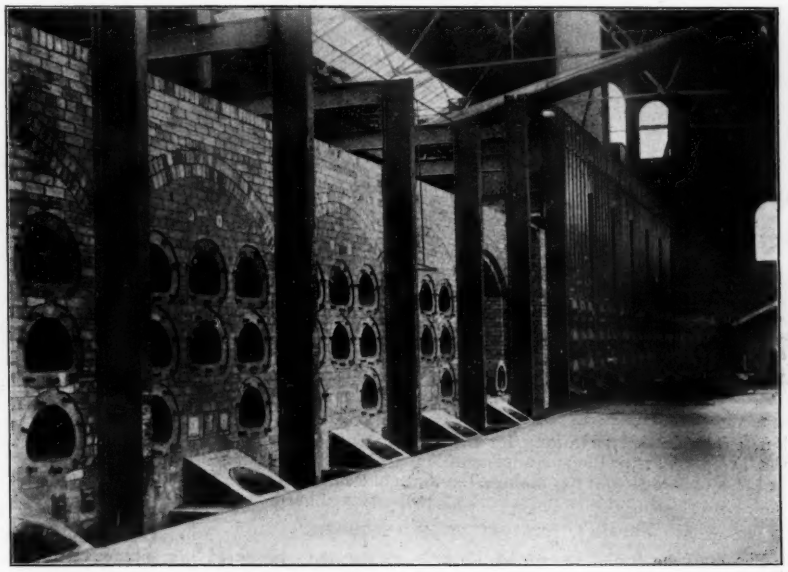


Fig. 3.—Interior of the Retort-House.

Before, however, treating of the coke-handling methods—temporary, permanent, and prospective—let us descend by the iron stairway at the end of the house to the basement, which is on a level with the railway lines. The clinkering chamber is on the coke discharge side of the house; and it extends the full width between the front of the bench and the walls of the house. Mr. Walker favours giving the men good space for work of this kind. From an examination of the working of the furnaces, it was seen that they were doing excellently. There was a perfectly clear flue; and the fuel account figures are such as would give satisfaction to any gas engineer. On the charging side of the bench, there is a basement about 7 feet wide; and in this the tar and water and service-gas mains are carried. On this side, too, the primary and secondary air supplies to the settings are regulated. The operating floors in the retort-house, which are level with the coke-ground, are supported on steel standards and girders, covered with cast-iron plates.

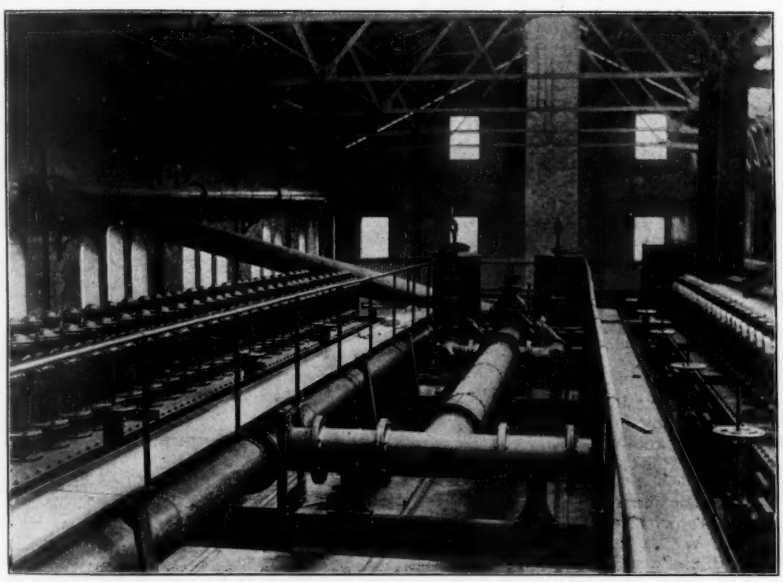


Fig. 4.—The Pipe Connections over the Retort-Benches.

The whole of the retort-house apparatus and machinery was constructed by Messrs. Drakes Limited, of Halifax; the walls of the house and coal-stores were built by Mr. S. F. Davidson, of Newcastle; and the structural ironwork by the Whessoe Foundry Company, of Darlington.

On leaving the retorts, the gas is taken through Parkinson and Cowan's retort-house governors into an 18-inch foul main running along the wall near the top of the retort-house. On reaching the south end of the present structure, this 18-inch main is connected to a 24-inch; and 24-inch mains are carried thence through the whole of the apparatus. As the retort-house is extended, an 18-inch main will be taken from the second section, and connected to the T-piece where the 18-inch main terminates and the 24-inch main commences.

Coke Handling.

The completion of these details enables treatment to be made of the methods of coke-handling. The present method is purely temporary. The spent charges are ejected by the pusher into large coke-barrows, which, after the first quenching in front of the retorts, are wheeled away by the men, and the coke deposited on the large paved coke ground, which, as before mentioned, has been specially levelled-up and made for the purpose. It was noticed that—the coke trucks being of a height suitable for the different levels of retorts—the coke is treated to the minimum of violence, and is placed in the yard in large size and with little (practically no) breeze. When the work develops, a pair of coke-conveyors will be put in the retort-house; and these will deliver into 1-ton trucks in the centre of the basement. An (at present bricked-in) archway has been left in the wall of the basement of the house so that the trucks can be run out, and most probably they will be lifted by a Temperley overhead travelling arrangement, and their contents deposited just where required.

Stepping outside the retort-house, we are on to the coke-ground. In one corner, in passing, is observed a mess-room for the retort-house men. The main feature of the coke ground is the large coke-loading dock in the centre. The levelling of the yard permitted this to be made, so that large-capacity trucks can be run in from the low-level line and be filled from above. The length of this dock at present is 200 ft.; width, 13 ft.; and depth, 12 ft. The dock is covered with steel joists with concrete filling; but, in the centre of each bay, openings are

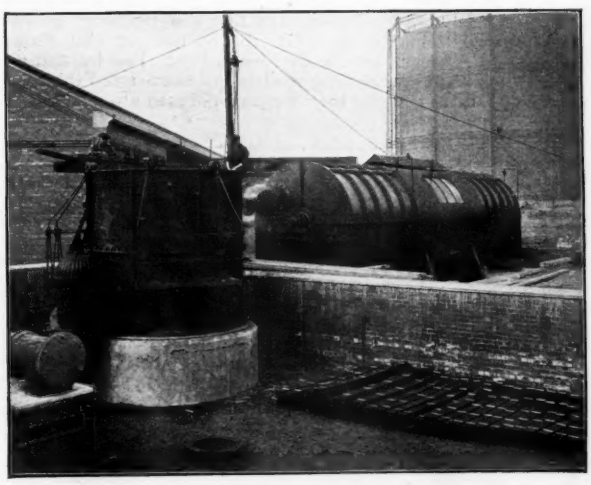


Fig. 5.—The Livesey Washer and Rotary Scrubber, with Tower Scrubber in Course of Erection.

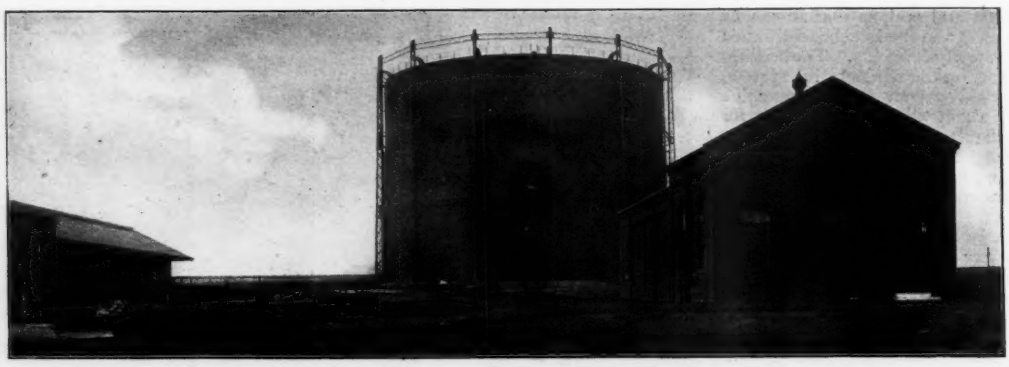


Fig. 6.—The Meter and Governor House, Purifiers, and Oxide Shed, with the Gasholder in the Background.

left, 4 ft. wide and 16 ft. long, for truck-filling purposes. When the Temperley travelling arrangement is put in, it is proposed to fit these openings with "combings," so that coke can be screened, and delivered direct into the trucks without any manual labour.

Condensers, Exhausters, and Boilers.

Passing from the coke ground, there is an excellent range of buildings, comprising the habitations for the condensers, exhausters, and boilers. The building for the condensers measures 28 ft. square inside by 30 ft. high to the underside of the tank; the exhauster-house, which is finished in neat style and has top lights, has an area of 60 ft. by 30 ft.; and the boiler-house measures 56 ft. by 37 ft.

Fig. 8.—The Inclined Railway leading to the Coal-Stores—Showing also the Oxide-Shed with Sliding Doors for Unloading the Material.

The condensers, by Messrs. R. & J. Dempster, of Manchester, are of the water-cooled type, of a capacity of 1¼ million cubic feet per 24 hours. The building, which is capable of holding another similar set of condensers, is roofed in by a cast-iron water-tank for the general supply of water to the works.

The exhauster house adjoins; and it contains exhausting apparatus and electrical generators for the working of the retort-house machines. The exhausters are of Messrs. George Waller and Son's make; the larger being of the twin type capable of dealing with 3 million cubic feet of gas per day when fully coupled up, or 1½ million cubic feet per day when divided. The smaller exhauster taken from the old works at Willington Quay is used for the purpose of dealing with the summer make of gas. The electrical machinery is in two units—one 15 Kw. and the other 20 Kw. Gas-engines by the National Gas-Engine Company are direct-coupled to generators made by Messrs. Bruce Peebles and Co. The switchboard is likewise placed in this house; and the whole of the apparatus is under the charge of the man attending to the exhausters. The switchboard is arranged with three circuits, two of which are at the present time in use—the one going to the motors driving the conveyor, and the other to the carbonizing machines, while on the third circuit it is intended to ultimately place the overhead coke railway. The switchboard is further arranged so that each circuit can be put on to either the same machines or on to independent machines. The house has a basement 10 feet high, in which the whole of the steam and gas pipes are assembled and exposed so as to allow of easy inspection and of rapid repairs in case of breakdown.

Adjoining the east end of the exhauster-house is the boiler-house, designed to eventually contain three Lancashire boilers. Meanwhile, there are one Lancashire and one Cornish boiler; the latter being removed from the old works at Willington Quay. The Cornish boiler is fitted with Meldrum's breeze furnace; and the Lancashire boiler is heated by Hislop's patent boiler producer, the working of which has proved very economical both as regards fuel and labour; the man in charge of the exhausters being able to do everything in connection with the boilers with the exception of the cleaning of the producers, which operation is only required once in 48 hours.

Grouped outside the boiler house are a Livesey washer, a tower scrubber, and a Whessoe rotary scrubber-washer. The latter is in two sections, capable of being worked together or independently by the one engine, and when coupled will deal with 3 million cubic feet of gas per 24 hours. The liquor from the rotary scrubber is collected in a supplementary liquor well, and pumped therefrom through the scrubber and from the scrubber through the Livesey washer back into the supplementary liquor well; the strength of the liquor in the well being regulated by means of the amount of fresh water admitted at the clean end of the rotary washer

Fig. 9.—Entrance to the Sidings from the North-Eastern Railway—Locomotive and Locomotive House in the Foreground, Sulphate House and Overhead Tar Tank in the Background.

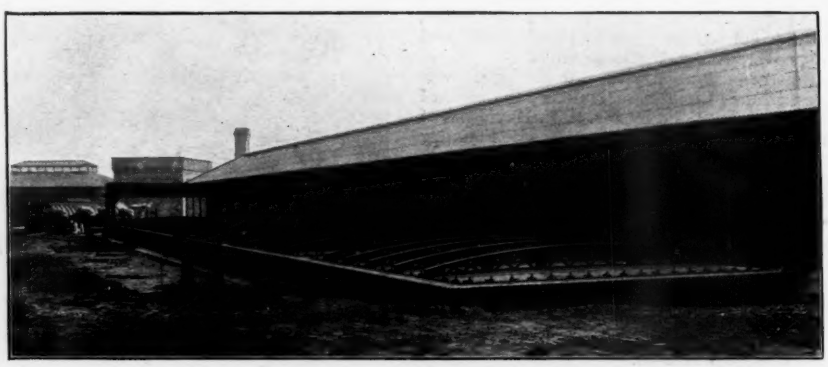


Fig. 7.—The Purifiers and Oxide Shed—Looking from the Gasholder.

scrubber. Adjoining this supplementary liquor well, and connected to it by means of a pipe, is the tar chamber, into which is discharged all the tar from the condensers, the syphon on the outlet of the exhausters, the tar run off from the Livesey washer, and the tar run-off pipes from the rotary scrubber. By this arrangement, no tar is allowed to get into the supplementary liquor well; and, therefore, the possibility of clogging the apparatus with tar should be reduced to a minimum.

Purifiers.

To the north of the rotary scrubbers are placed the purifiers, constructed by Messrs. R. & J. Dempster, Limited, of Manchester. There are six vessels, 30 feet square, in one continuous box. Four of these are used for oxide of iron and two for lime; the oxide set being worked by means of a four-way Weck valve, and the lime set by means of a two-way Weck valve. The covers are in one portion, 27 feet square, and are raised by a hydraulic cover lifter. Immediately to the west of the purifiers are placed the oxide and lime sheds, which are connected by means of accommodation doors to the inclined railway leading to the coal-stores, so as to facilitate the delivery of oxide or lime.

Meter and Governors.

From the purifiers the gas is taken to the station meter, the capacity of which is 120,000 cubic feet per hour. Adjoining the meter-house is the governor-house. This house has also a basement in which is situated a collecting-chamber, into which all the gas made is taken, and to which the inlet-pipes of the holders are connected. At right angles to this collecting chamber is placed the distributing chamber, to which the outlets of the holders are connected, and from which the gas passes through the governors. The meter and governors were supplied by Messrs. J. & J. Braddock, of Oldham; and the valves by Messrs. W. C. Holmes and Co., of Huddersfield.

Gasholders.

As will be seen from the plan, there is only one gasholder erected at the present time; but there is ample room for another two—one of 1½ million cubic feet, and one of 2½ million cubic feet capacity. Some particulars of the one now in use were given in the opening to this article.

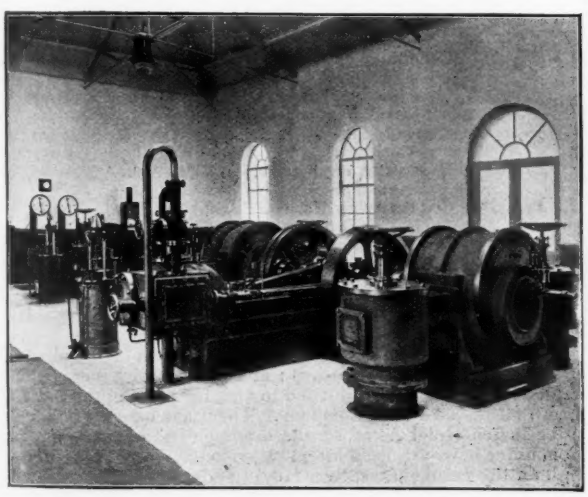


Fig. 11.—Interior of the Exhauster House.

Stores and Workshops.

Adjoining the boiler-house are the stores, mechanics' shop, and smiths' shop; and facing Howdon Lane are the offices. Inspecting these ranges of buildings, every convenience is found for the efficient discharge of the executive duties associated with the works. The equipment includes a laboratory and photometer room—the photometer being by Messrs. Alex. Wright and Co.

Tar and Liquor Tanks.

These have been previously mentioned; but a few additional particulars can be given. As stated, the wells are placed at the southernmost part of the site. This portion of the land was originally about 14 feet below the level of the railway; and as the contour of the site permitted a regular fall for condensed matter towards this point, the storage wells were constructed there. The walls are built of concrete and puddled outside; the cover being made by means of rolled steel joists and expanded metal in concrete—the whole of the joists being protected by concrete on the underside. Close to the storage well is placed an overhead tank from which the railway tar-tanks are filled. This tank is supported at the top of a building that has been specially provided for accommodating the tar and liquor pumps.

Sulphate-House.

Here we have a building that is divided into three apartments—the first contains the sulphate manufacturing plant, the second

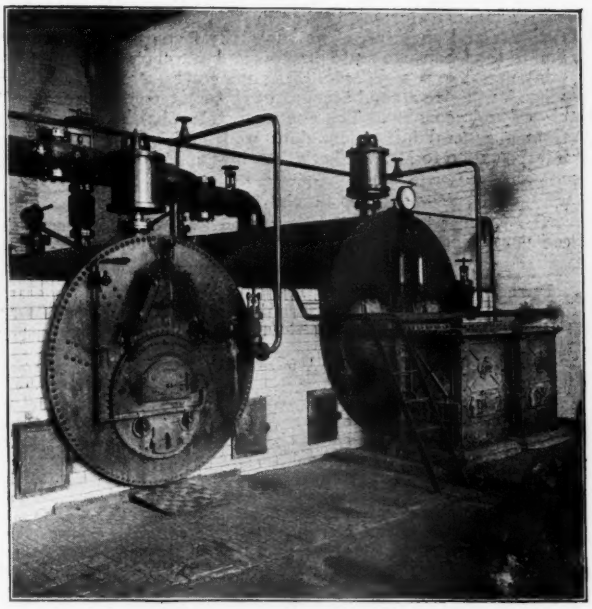


Fig. 10.—Boiler-House with Hislop's Patent Producer Attached to the Lancashire Boiler.

is the store, and the third affords accommodation for bagging and loading, so that everything is done under cover. All three apartments are in communication one with the other. The overall dimensions of the area occupied by the building are 70 ft. by 26 ft. The sulphate plant (which was removed from the Willington Quay works) is of Pettigrew's make, with one of Taylor's solid lead saturators. The productive capacity is 1 ton a day. Storage tanks for acid adjoin the sulphate-house, and at a level to permit of the running of the acid direct from railway trucks. This tank has a capacity equal to 8 tons of acid. In line with, but a little distance from, the sulphate-house is the

Locomotive House.

This is placed close to the beginning of the incline leading to the north end of the works. The house was constructed by Messrs. Hawthorn Leslie and Co., and was in use during the construction of the works, rendering great facilities in the delivery of contractors' material.

General.

The works, as previously stated, were put into operation on May 28 last; and it is satisfactory to be able to record that there has been no stoppage of any kind, everything working in a most satisfactory manner. The old works at Willington Quay are now being dismantled; and so soon as the trunk mains are laid from the Howdon Lane works, it is probable that the Walker works will be closed. These works, however, will not be dismantled, but will be used when the requirements of the district exceed the power of the Howdon Lane works.

The gasholders at the Willington Quay works will be used for the supply of Willington Quay district only, while the gasholders at Walker will be kept in reserve to take up any exceptional consumption in that district; all the holders being filled from the Howdon Lane works.

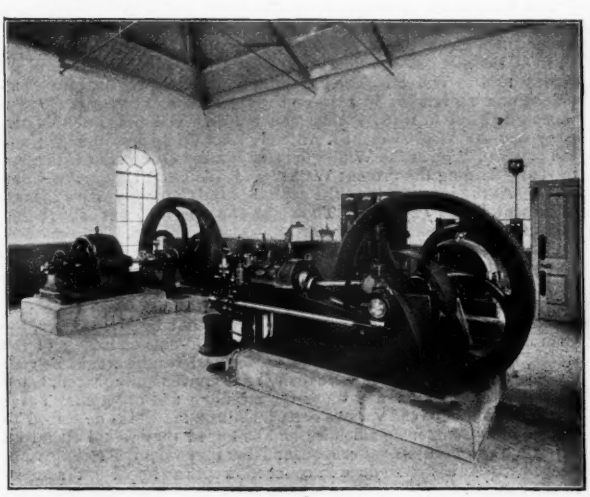


Fig. 12.—The Exhauster House—Showing the Electrical Generating Plant.

Our concluding words must be of congratulation to Mr. Walker on the manner in which he has availed himself, with credit as a designer and engineer, of an especially favourable opportunity, and to the Chairman and Directors and shareholders of the Company upon the possession of these new works, which, we are convinced, will give a good account of themselves in respect of efficiency and economy. The contractors, too, have all, we believe from a general inspection, done well, and have given careful interpretation to Mr. Walker's drawings and specifications.

The Official Opening.

The new works were officially opened on Friday afternoon; the ceremony being largely attended and favoured by fine weather.

SHAREHOLDERS' MEETING.

Prior to the formalities, an Extraordinary Meeting of the shareholders in the Company was held in the Board Room—Colonel CRAWFORD, the Chairman, presiding—to consider a proposal to issue additional capital.

The SECRETARY (Mr. C. H. Armstrong) read the notice convening the meeting, after which

The CHAIRMAN moved a resolution to authorize the Directors to increase the capital by the creation of £10,000 of 5 per cent. preference stock, and £10,000 of ordinary stock. The new capital, or part of it, would be called up about the end of the year. The money was required entirely in connection with the extensions that had been going on, and that were still being carried out at the new works. The Company had, as a rule, increased their capital according to requirements. The Directors hoped that this would be the last increase so far as their present scheme was concerned—at any rate, it was all they could see before them just yet. He thought they would agree with him that, so far as they could judge, everything in connection with the scheme had been carried out in a most economic and satisfactory manner.

Alderman G. A. ALLAN, the Deputy-Chairman, seconded the motion, which was carried unanimously, as was also a resolution sanctioning the borrowing of further sums on mortgage.

The CHAIRMAN expressed his satisfaction that they had had such a good attendance of shareholders. It was very seldom that they got such a large gathering; and he had no doubt that the interest which they all took in the new works was one of the motives which had brought them forward, independent of the importance of the resolutions which had just been passed.

Mr. DEES, in proposing a vote of thanks to Colonel Crawford for presiding, said he was sure it must be a matter of gratification to him and his fellow-Directors to see so many shareholders around the table. He (Mr. Dees) had been to a good many meetings, and had never seen such a gathering as they had that afternoon. He thought, perhaps, it would not be inappropriate at this juncture to express the sympathy of the shareholders in respect to the accident at Walker. They hoped those who were injured would speedily recover, and that none of them would be any the worse for the experience which befel them.

The CHAIRMAN, responding to the vote, which was carried with much heartiness, said the unfortunate event referred to was the only serious accident they had had since the works were formed—a fact for which they had every reason to feel grateful. The works were insured, though the house that was destroyed by the explosion was perhaps hardly fully insured. The gas-engine was very little the worse. The thing they had most reason to congratulate themselves upon was this, that the men who were injured ran very considerable risk in the endeavour to prevent further damage. Therefore the Directors, in consideration of their conduct, proposed to make up the difference between what they received as compensation and the amount of their wages. He was glad to be able to add that all the men were getting on very well indeed.

The meeting then terminated; and the shareholders proceeded to the yard, and congregated near the main entrance of the works, to participate in the official opening.

THE OPENING CEREMONY.

Colonel Crawford was supported by Messrs. George A. Allan, J. R. Lownds, Charles J. Crawford, J. Wigham Richardson, J. Potter, and M. W. Swinburne, Directors; Mr. C. H. Armstrong, the Secretary; and Mr. A. B. Walker, the Engineer—all of whose names are inscribed on a large tablet affixed to the front wall.

The CHAIRMAN, in formally unveiling the tablet and inaugurating the works, said it gave him very great pleasure to welcome them there under such favourable auspices. These works, which were about a third of the stock of the Company, were a development of the works commenced in Walker. The gas-lighting of Walker by private Companies was undertaken in 1840 and 1853; and in Willington Quay it was carried out in 1848 by Alderman Potter. The first public Company was the Walker and St. Anthony Gas Company, in 1851; and the amalgamation of the Willington and Walker Companies took place in 1861—forming the present Walker and Wallsend Union Gas Company. At the incorporation the capital of the Company was £19,000; at present, it was £250,000. The make of gas in 1866 was only 18 million cubic feet yearly; last year it was 307 millions. The price to ordinary consumers at the beginning was 4s. 6d. per 1000 cubic feet; last year it was 2s. 3d. There had, however, since been an advance of 3d. on account of the rise in coals. The works which they saw that day covered a space of 12½ acres; and the land was entirely freehold. The scheme had been most efficiently carried out by Mr. Walker, the Company's Engineer; and, owing to the up-to-date character of the works, it was anticipated that the economical results would be very considerable. The works were really most conveniently placed, being accessible both by rail and water for receiving and dispatch. Those present would have the various departments of the works described to them by the Company's officials; and he hoped they would spend an enjoyable and profitable afternoon, and that they would all feel pleasure in seeing what had been done in connection with an important industry in the district.

A photograph of the tablet and the company having been taken, an inspection was made of the works, and subsequently light refreshments were provided in the offices of the Company.

AMERICAN GAS INSTITUTE.

Programme of the Annual Meeting.

The Third Annual Meeting of the American Gas Institute will be held in New York from the 21st to the 23rd inst., under the presidency of Dr. A. C. Humphreys, of New York, the Principal of the Stevens Institute of Technology. The business will be transacted in the Auditorium of the United Engineering Societies' Building, in which are located the permanent head-quarters of the Institute. The following is a list of the papers and reports to be submitted to the members:—

Papers.

"High-Pressure Distribution." By Mr. Jacob D. von Maur, of St. Louis (Mo.).
"Benzol Enrichment." By Mr. E. H. Earnshaw, of Newark (N.J.).
"Some Further Remarks on the Photometry of Gas." By Charles O. Bond, of Philadelphia.
"Physical Theory of Coal Carbonization." By Mr. W. H. Fulweiler, of Philadelphia.
"Vertical Retorts." By Mr. J. H. Taussig, of Philadelphia.
"Relative Merits of Wrought-Iron and Steel Pipe." By Mr. Frank N. Speller, of Pittsburg.
"Report of Progress on 'A' Meters." By Mr. W. J. Serrill, of Philadelphia.
"Report of Progress on Dipping Meters." By Mr. W. A. Castor, of Philadelphia.
"Holder Cups and Tank Heating." By Mr. C. J. Ramsburg, of Philadelphia.
"Better Gas Illumination." By Mr. Thomas J. Litle, jun., of Gloucester (N.J.).

General Reports.

Report of the Public Relations Committee (Mr. E. G. Cowdery, of Chicago, Chairman).
Report of Technical Committee (Mr. W. H. Gartley, of Philadelphia, Chairman).
Report of Board of Revision of the Question-Box on the Manufacture of Gas (Mr. J. D. Shattuck, of Chester, Chairman).
Wrinkles (Mr. M. R. Bump, of New York, Editor).
Accidents (Details by Members).

Reports of Sub-Committees of the Technical Committee.

Report of Committee on Calorimetry (Mr. R. B. Brown, of Milwaukee, Chairman).
Report of Committee on Uniform System of Accounting (Mr. R. A. Carter, of New York, Chairman).
Report of Committee on Pipe Standards (Mr. A. S. Miller, of Baltimore, Chairman).
Report of Committee on Electrolysis (Mr. A. G. Glasgow, of London, Chairman).
Report of Committee on Units of Light (Mr. W. H. Gartley, of Philadelphia, Chairman).
Report of Bureau of Information (Mr. W. A. Baehr, of St. Louis, Chairman).
Report of Proceedings of International Committee for Standardization of Threads for Gas Appliances (Mr. A. G. Glasgow, of London, Delegate).

During the meeting there will be an inspection of the plant of the Consolidated Gas Company; and after the business on the 23rd, the members will be invited to visit the plant of the Astoria Light, Heat, and Power Company. The usual banquet will take place in the Hotel Astor, on the evening of the 22nd; and the Committee have arranged for an excursion to West Point on the 24th for the members and their lady friends.

Effect of Alkali on Portland Cement.—The effect of alkali on portland cement is under investigation by the engineering and chemistry departments of the Montana Agricultural College Experiment Station, Bozeman (Mont.) and a preliminary report has recently been issued above the signatures of Professors E. Tappan Tannatt and Edmund Burke. According to "Engineering Record," it was found some years ago that the mortar, cement pipe, and brick in two sewers of Great Falls were rapidly disintegrating at certain points; so in 1907 the problem was taken up by the Experiment Station at the request of Mr. C. W. Swearingen, the City Engineer. The examinations showed the cement mortar lining covered in many places with a white efflorescence or powder; and further investigations seemed to show conclusively that, in the first place, the rapid disintegration did not come from adulteration of the cement, or from the quality of the materials; secondly, that the limited chemical and physical action of the alkali salts in the soil might be a partial cause of the breaking-down of the brick, which was too soft and unfit for sewer construction; and, finally, that the action on the cement was chemical, and that the destructive agent came from outside the sewer. Analyses of numerous samples of soil taken along the lines of the two sewers showed that these samples were strongly impregnated with alkali; that the maximum disintegration of the sewers occurred where the percentage of alkali was greatest; and that the amount of disintegration corresponded closely to the percentage of alkali present. The conclusions reached are not considered final; and the investigations are to be continued.

THE TURIN CONSUMERS' GAS COMPANY.

For three or four years past, we have annually described and illustrated the works of reconstruction and reorganization that have gradually modernized the gas-works in Turin, belonging to the Società Anonima dei Consumatori di Gas Luce of that bright and pleasing Italian town. Now the more important works are completed; and to-day we give reproductions of three excellent photographs showing the exterior and the interior of the ammoniacal liquor house.

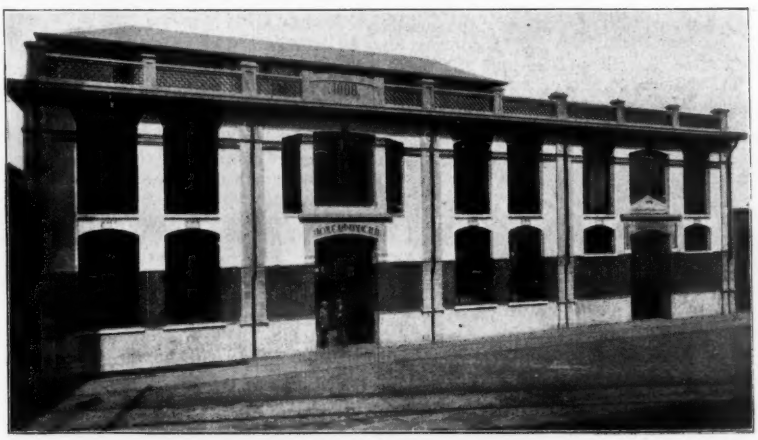


Fig. 1.—New Buildings at the Turin Gas-Works, for Dealing with Ammoniacal Liquor.

Fig. 1 shows the practical tastefulness of the design of the building adopted, with its partly flat roof and neat parapet. On one (the left) side is the plant itself; and on the other (the right) is the "*magazzino*" or store. Inside are two sets of apparatus. One set, shown in fig. 2, is for merely concentrating the liquor; while the other, seen in fig. 3, is a complete sulphate of ammonia plant. The wisdom of having two such independent plants will be known to all who in foreign parts have had experience of working-up and disposing of ammoniacal liquor. A large Babcock and Wilcox boiler, of 185 square metres heating surface, has been installed to supply the steam that is required for the ammoniacal plant.

Another piece of work that is now going on, and will be finished next spring, is the erection by Messrs. S. Cutler and Son of a gasholder having a capacity of 35,000 cubic metres, or 1,236,000 cubic feet. This holder will work in a reinforced cement tank, the inside diameter of which is over 45 metres (147 ft. 8 in.), and has just been successfully tested. The various works which have thus been going on gradually for some time will bring the output of the gas-works up to about 100,000 cubic metres, or (say) over 3½ millions of cubic feet per day.

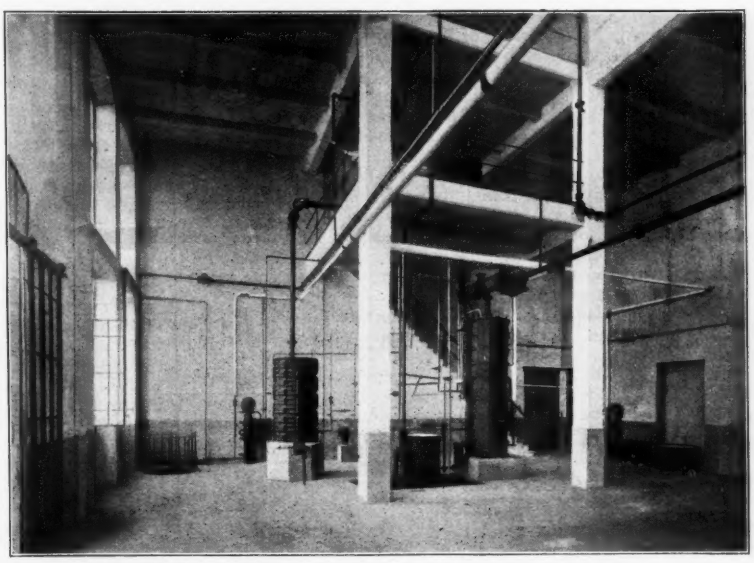


Fig. 2.—Apparatus for Concentrating the Liquor.

Another interesting point about the gas undertaking at Turin is that, in respect of the price charged for gas, it is, one may say, the Widnes of Italy; for the Consumers' Company sell gas at the lowest figure of all companies in Italy—namely at 12 c. per cubic metre, which is equivalent to 2s. 8¾d. per 1000 cubic feet. Of course in considering this figure, the extra cost of coal abroad and many other items must not be overlooked. At the meeting of the Società Consumatori, which was held on Sept. 15, under the President, Sig. Cav. Gioachino Fornas, it was rightly regarded as matter for congratulation that, notwithstanding the increased cost of coal during the past twelve months, the price of gas was not raised, though the balance carried forward amounted only to 2246.73 lire (£90), instead of, as in the previous year, to 41,471.10 lire (£1659). Thus there was really a loss on the year's working compared with the previous one. But confidence was expressed in achieving economies in the forthcoming year, by reason of the lower prices for coal, greater economies in working the new plant, and the continuous increase in gas consumption.

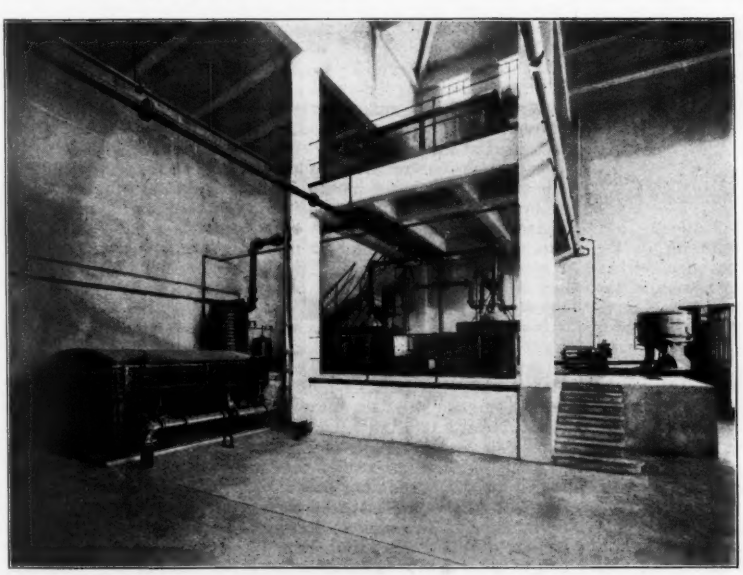


Fig. 3.—Complete Sulphate of Ammonia Plant.

The annual report (which we always find interesting reading as it is clearly, frankly, and brightly written, and illustrated) shows

the gas sold during the past year was 17,649,502 cubic metres (say, 623 million cubic feet), instead of 16,730,548 cubic metres (say, 591 millions) the preceding twelve months. Of the amount of gas sold, nearly 91 per cent. passed through ordinary meters; 1 per cent. through "slot" meters; over 1½ per cent. was used for industrial purposes; 1 per cent. for gas-engines; and over 5 per cent. for street lighting. The number of meters went up from 29,403 to 31,403; the average consumption per meter being 565 cubic metres (or 19,954 cubic feet) instead of 534 cubic metres (or 18,859 cubic feet). Such increased consumption per meter must certainly be considered satisfactory. Needless to say, the length of mains has been extended—now reaching 297 kilometres or about 186 miles. Important mains have been laid—one of 1 metre (39⅜ inches) diameter, and the other 600 mm. or 24 inches in diameter, which will greatly benefit the town pressures.

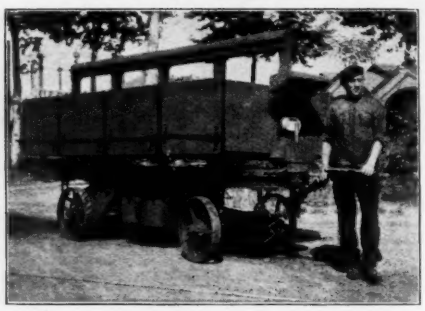


Fig. 4.—Electrically-Driven Coal Waggon Carrying Coal from the Stores to the Retort-House.

Fig. 4 shows a coal carrier of some novelty. It is an electrically driven waggon, which is guided by the man in front, and is used to carry coals from the gas-works' stores to the retort-house. It has proved both practical and successful. The amount of coal carbonized has been 60,578 metric tons, which is 4722 tons more than in the previous year. The make of gas per metric ton is 314·5 cubic metres, which works out as equivalent to a make of 11,285 cubic feet to the English ton. In the retort-house, we note that twelve beds have been remounted; but an interesting addition is another two beds by M. Hovine, of Paris, on his special system of heating by coke breeze and coal dust. There are already two beds on this system, which have given good results; so two more are now to be added with a view of having as much coke as possible for sale.

In concluding this brief review of an interesting works and its working, we are glad to observe that the Italian railways are now running more smoothly, with a more plentiful supply of trucks; and we congratulate Sig. Fornas, the President, and his Board, and the Manager, Sig. Giacomo Beria, on the happy result of their labours of reconstruction and management.

German Acetylene Association—Programme of Meeting.

The tenth ordinary general meeting of the German Acetylene Association has been arranged to take place at Eisenach on Monday, Tuesday, and Wednesday of this week; and among the technical papers to be presented are the following: "The Essential Points of Acetylene Apparatus for Autogenous Welding," by Dr. Auton Levy, of Berlin; "The Requisite Degree of Purity of Acetylene for Autogenous Welding," by Professor J. H. Vogel, of Berlin; "The Present Position of Autogenous Welding," by Herr Theo. Kautny, of Rodenkirchen; "Inverted Incandescent Acetylene Burners," by Herr L. Kuchel, of Budapest; and "On Air Gas," by Dr. Paul Wolff, of Berlin. The rules for dealings in calcium carbide are to come up for revision at the meeting.

The Junior Institution of Engineers on Monday of next week hold their annual meeting, followed by the annual meeting of the Benevolent Fund.

Electrical Units and Standards.—On the invitation of the British Government, an International Conference on electrical units and standards will be held in London at the rooms of the Royal Society during this month. Eighteen countries are sending delegates to the conference. The first meeting was fixed for yesterday; and the others are expected to last until the 22nd inst. This date, however, is not fixed, as it will depend entirely on the progress made with the work. The main object of the conference is to obtain international agreement on the three electrical units—the ohm, the ampère, and the volt—so that the realization of these units in all the countries of the world shall be as near as possible identical. The representatives of Great Britain are Lord Rayleigh, the President of the Royal Society, and the Chief Gas Examiner for the Metropolis; Professor J. J. Thomson, of Cambridge; Sir John Gavey; Dr. R. T. Glazebrook, the Director of the National Physical Laboratory; Major W. A. J. O'Meara, the Engineer-in-Chief to the General Post Office; and Mr. A. P. Trotter, Electrical Adviser to the Board of Trade.

DISCHARGE SHOOTS FOR GAS-PURIFIERS.

By R. J. Milbourne, Assoc.M.Inst.C.E.

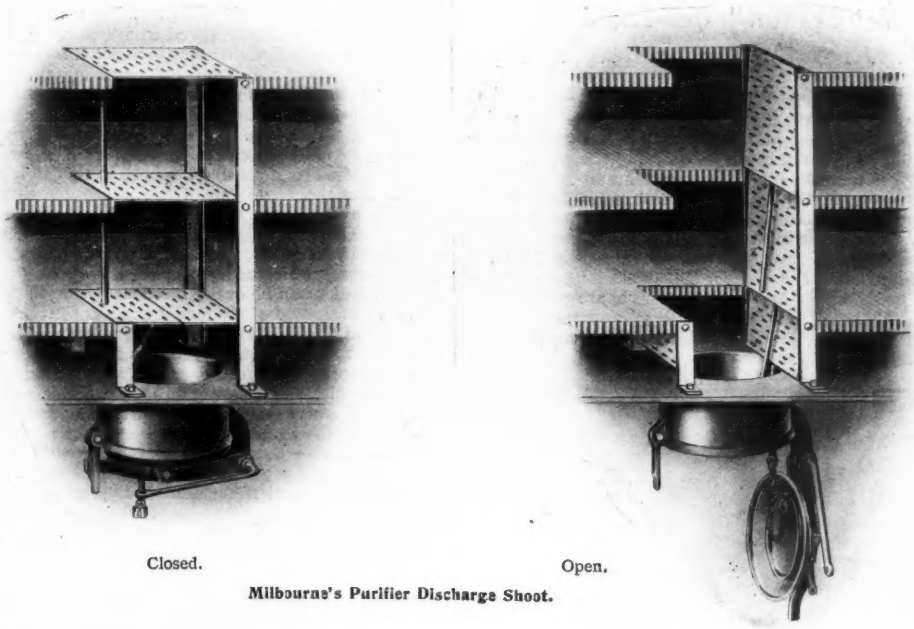
Whenever a set of purifiers is erected on a stage-floor and in an overhead position, with the ground space underneath arranged for revivifying the purifying material, it becomes essential to make provision for the discharge of the spent material—lime, oxide, or other purifying agent—through the bottom of the box on to the floor below. Hitherto this has been done by one of the three methods known as (1) cast-iron discharge pipes, (2) perforated trays, (3) wooden discharge hoods.

The first method—cast-iron discharge pipes—consists of a vertical pipe fixed inside the purifier-box, and made up of a number of separate sections corresponding with the number of tiers or layers of grids. The first or lowest section is a flange and socket piece; the flange being bolted to the purifier bottom plate. The remaining sections are all socket-and-spigot pipes; the sockets being all slightly larger than ordinary pipe-sockets, and the spigot ends are turned—in fact, some engineers specify the ends to be turned down to a knife-edge. The usual method adopted to make these socket joints gas-tight, and at the same time leave the sections in such a condition as to be readily removable, is by ramming them hard with fresh purifying material. Simultaneously with the discharge of each tier of spent purifying material, the corresponding section of discharge pipe is removed; and thus is facilitated the moving of the remaining layers until the bottom is reached and the purifier-box emptied. Immediately below these discharge pipes, and secured to the underside of the purifier bottom plate, is a discharge mouthpiece, with the usual self-sealing lid, cross-bar fastening, chain, and padlock complete. To this system of discharging, there are obvious disadvantages. Among them may be enumerated the following: (1) Reduction of purifying area, owing to the amount of space occupied by the discharge pipes; (2) danger of gas taking a short-circuit at the joints, or up the sides of the discharge pipes; (3) danger of the purifier being filled while the mouthpiece lid at the bottom remains open, the closing of same having been overlooked; and (4) the sections of the discharge pipe are very cumbersome and inconvenient for lifting, owing to their weight.

The second method, known as "perforated trays," may be considered a decided improvement upon that just described; but this is by no means perfect. The trays consist of circular perforated steel plates, about ⅜ inch or ½ inch in thickness, varying in number according to the number of tiers of grids in the purifier-box. They are fixed at the same level as the sieves, and are secured in the centre to a steel screwed spindle, the whole supported upon a frame of four flat steel feet, each of the feet resting upon a lug or projection cast inside the discharge mouthpiece, fixed below the purifier bottom plate. In emptying a purifier by this method, the whole series of trays, loaded with the spent material, is raised 2 inches or 3 inches by means of a rope and pulley-block (or other suitable lifting tackle). Then the trays are made to slightly rotate, in order to bring the feet clear of the lugs upon which they have been supported; and the complete trays are finally lowered through the discharge shoot on to the floor below. The disadvantages of this method are much the same as those previously mentioned, except that there is no loss in purifying area, and, consequently, no danger of the gas taking a short-circuit. Upon refilling the purifier, the trays have again to be hauled up and fixed in position; and in this case also there is liability of overlooking the closing of the discharge door. In each and every instance special tackle has to be rigged up for the raising and lowering of the discharge trays, often at very considerable inconvenience and loss of time and expense.

The third arrangement, of wooden discharge hoods, is perhaps the most crude method extant, and therefore calls for little mention. It combines the whole of the disadvantages of the previous two systems, with some measure of increased difficulty in raising the hoods. The arrangement consists of a square frame of wood, provided at the top with an eye, or other means for lifting; and it is necessary to remove the hood in order to empty the material through the discharge mouthpiece on to the floor below. It has to be refixed once more in position when re-charging the box. As before mentioned, the same disadvantages recur—only by this method in an intensified form. It is perhaps as well to add that there is also the old-fashioned arrangement of hinged grids over discharge mouthpieces; but this method may now almost be considered obsolete.

To sum up a review of the whole of these arrangements, they each suffer the very great disadvantage—and, indeed, the great danger—of the discharge lid being overlooked or forgotten to be closed when the purifier is filled and the gas turned on. The large volume of gas escaping through an open door might very easily become ignited by some naked light, and a very serious explosion result. None of the systems contains any indicator or device for the purpose of reminding the operators to securely fasten the discharge door before proceeding to refill the purifier-box with fresh material; and experience has only been too fruitful in showing how serious accidents have occurred through the neglect of this precaution. Your readers will no doubt be able to call to mind many instances recently reported in the "Journal," all directly traceable to this cause, when apparatus or property



Closed. Open.

Milbourne's Purifier Discharge Shoot.

worth thousands of pounds was destroyed and men very seriously injured—not a few of the injuries proving fatal.

The automatic "safety" discharge trays and shoots for gas purifiers which the writer has recently patented and placed upon the market have been designed with the special object of overcoming all the disadvantages of the systems aforementioned, and also to enhance the facility and easy working of the operations connected with the emptying and re-charging of the purifier boxes. A corollary of all this is the very great saving of time—a most important factor at every gas-works during these operations. Where this apparatus is provided, no purifier can be refilled unless the discharge mouthpiece lid be first closed; thus eliminating a very grave danger. Further, the time required to open the discharge door is reduced to a minimum; and there is no necessity for the use of cumbersome lifting tackle and ropes. As will be seen from the illustration, this arrangement consists of three, four, or any number of perforated trays, fixed on a level with the tiers of grids.* Each tray is rectangular in shape; and the upper trays have their hinged bars constructed in the form of hooks, in order to render them readily removable when the purifier is to be emptied. These hinged bars form a support for one side of the tray, taking hold at the hook end of a rod fixed across the vertical angle frame; the other side being supported when in the horizontal position by means of a horizontal rod or supporting leg having a slightly rounded end. This rounded end enables the leg, by resting in a slight abrasure in the tray immediately below it, to retain its vertical position, and thus keeping the supported tray perfectly horizontal.

The lowermost tray is divided into two parts; one part being connected permanently with the discharge door by a supporting leg and chain. The supporting leg is hinged at the upper end to the tray; and the tray is provided with, and permanently attached to, supporting hinges on which the tray swings. The lower end of the supporting leg is in turn connected with the discharge lid by means of a chain, so that the discharge door, supporting leg, and permanent hinge, and half portion of the lowest tray, are all connected together in such a manner that the trays cannot be fixed into position until the discharge door is properly closed. The supporting leg of this lowermost tray is held in position by a projection cast on the inside of the mouthpiece at such an angle that when the discharge door is opened it carries with it the chain, which, in turn, pulls the supporting strut off the projection, and the whole of the trays, thus losing their support, fall down. The half of the lowest tray which is not connected direct to the discharge lid is fitted with hinged hooks at one end, which attach to a rod secured by a pair of short flat-iron uprights. The support for this half of the tray at the centre is provided by a jaw (to which the supporting strut is hinged) being extended beyond the fixed half of the tray, as shown. This arrangement relieves the door from all weight of the trays and purifying material; and the discharge door has thus only to resist the ordinary gas pressure. The lowermost tray is also arranged in halves in such a manner that when these trays are open no portion of the tray necessarily enters the discharge mouthpiece.

When the action is started for opening the trays, the vertical leg, following the travel of the tray that supports it, removes its support from the tray to which it is fixed, enabling the latter to rotate and fall forward on its hinges, and so discharge the spent material which it carries—thus leaving a clear and open passage through which all the material can be thrown on to the floor below. Immediately the lid is released, the momentum it requires in opening is transmitted, by means of the chain and rod, to the first perforated tray; and as this tray forms the basis of the support of all the other trays, they are automatically released from the horizontal position, and a passage is at once secured from the top tier of grids through the bottom of the purifier and the discharge mouthpiece, as seen in the second illustration.

From the above description it will readily be observed how impossible it would be to start charging the box with the purifying material until the first or lowest tray is placed in position. This can only be done by the actual closing of the lid of the discharge door; and all risk of leaving the door open is entirely removed. Once the first tray is fixed, the remainder, of course, follow on when filling the purifiers in the ordinary way. When the upper trays have opened to a certain slope, their supporting leg slips or slides away from the upright position, and finally all the trays lie close to the angle-iron frame, and quite flat against each other. A glance at the illustration will make this clear. The mouthpiece lid and fastening call for no special remark. They are of the usual type; and the lever is provided with a special handle for locking, so that unauthorized interference may be prevented. Various modifications of details can be made to suit existing purifiers; but sufficient has been said to show the general and usual way of adapting this apparatus to new purifiers. It may be added that these shoots can be applied with any kind of grids, either ordinary, "Standard," "Hurdle," or "Gate" grids.

This article will no doubt prove of interest to those gas engineers who already have an overhead purifier installation, or are contemplating the erection of such a structure. It also suggests to one's mind the question of the relative advantages to be obtained from purifiers erected overhead on girder floors, against such apparatus erected on the ground level. The subject, however, is a wide one, and well worthy of a separate article.

* The patent specifications for the arrangement here referred to were abstracted and illustrated in the "JOURNAL" for Jan. 21 last, p. 179, and March 17, pp. 709-10.

A Household Gas Cookery Book.

We have received "The Household Gas Cookery Book," a new work issued under the joint authorship of Miss Helen Edden and Mrs. N. Moser. The name of the first-named lady will be familiar to many of our readers in connection with the Earl's Court Exhibition, as well as in her capacity as principal demonstrator in cookery to the Gaslight and Coke Company. Moreover, she is the designer of a gas-stove which was noticed in our columns a short time ago. Her colleague has for many years been studying cookery, both practically and scientifically, in England, on the Continent, and in America; and she is a regular contributor to "La Cuisine des Familles," the leading French journal dealing with cookery. Both ladies, therefore, possess full qualifications for their task; and their aim has been to produce a book providing a practical knowledge of modern cookery within the scope of a home of moderate means. Special care has been taken that all the recipes, many of which are original, are correct in materials, quantities, method of manipulation, and times required for the various operations; and they have all been tested in actual use. Included in the book are a selection from the best Continental and American sources, little known here, but particularly suited to English tastes and habits. The various ways of cooking are analyzed, and the authors give reasons for their advocacy of gas as the culinary agent. The book is published at No. 62, St. Martin's Lane, W.C., at the price of 1s. 6d. net, bound in cloth; and each copy contains an accident insurance coupon for £500 for one year.

NEW "CANNON" GAS-FIRES.

THE sudden arrival of somewhat more seasonable climatic conditions than have of late been experienced, would immediately cause that rush of business in the fixing of gas-fires for which manufacturers have for a long time past been actively preparing; and, while waiting for this desirable condition of things, an excellent opportunity is afforded of drawing attention to the latest designs in heating appliances. Already a number of patterns which are being introduced this season have been noted in the "JOURNAL;" but the list so far is not complete. There are, for instance, a new series of fires that have been designed by the Cannon Iron Foundries, Limited, of Deepfields, near Bilston, which demand attention at our hands. These are named the "Adams," "Elizabethan," and "New Style;" and they possess several distinctive features that are calculated to secure for them no small share of popularity.

The "Adams" Gas-Fire.

With a gas-fire, a good appearance—though, of course, not the most essential qualification—is a very important point; and in this respect, the new "Cannon" fires do not leave anything to be desired. Instead of being enamelled or bronzed all over, the fires are provided with enamelled iron panels, fitted into a black polished framework, round the inner edge of which there is a

The "Elizabethan" Gas-Fire.

polished metal beading. The effect produced is pleasing to the eye; but there are also some other substantial advantages. Should the enamel become chipped by accident or rough usage, the renovation of a stove that was enamelled all over would naturally be a much more costly operation than the mere renewal of one or more panels, as might be required; while in the event of a "Cannon" fire being removed from one room to another, or the style of decoration of the room in which it is placed being changed, a set of panels of a different colour to match the changed conditions can easily be substituted. The range of colours in which the panels can be had is sufficiently wide to meet any taste or scheme of decoration. While the demand at the present time is found to be chiefly for fires having a single row of fuel, all three of these new designs are made both in this style and with double rows. For the single row of fuel, there are three sizes—8-inch, 10-inch, and 12-inch fire; and for the double row, two sizes—10-inch and 12-inch fire. They are all made with reflecting sides and fender arranged to throw off the heat which strikes them in such a manner as to increase the efficiency of the fire; and the ornamental fender can be easily lifted away for the purpose of cleaning. The removal of the fender exposes the burner, which simply hangs, and this is easily taken out, when anything is required to be done to it. In fact, as there is no screw or anything of the kind to loosen, the burner can, it may be said, be removed instantaneously. The fires embrace all the latest principles; and the air and gas regulators with which they are provided are fitted underneath the fender, so as to be out of reach of anyone who might otherwise be tempted to tamper with them, and at the same time easily get-at-able in case of need. Finally, in the matter of first cost these new designs of "Cannon" fires compare very favourably with that of all-enamelled stoves, apart altogether from the convenience of being able, at a small outlay, to change the panels at will.

The "New Style" Gas-Fire.

The radiator branch is an important feature in the business of the Cannon Iron Foundries; and in this department also improvements are being introduced for the coming season, in connection with the valves and guards. As an indication of the demand that is being experienced for heating apparatus of this character, it may be mentioned that the firm last year supplied at Southampton, on hire through the Gas Company, just under three hundred radiators; and they are hoping to do at least as well this season. And similar business is now being undertaken, among other places, at Portsmouth. Coming to smaller, but by no means unimportant things, reference may be made to a convenient bread toaster which we noticed at the firm's London show-rooms, No. 18, Holborn Viaduct, E.C. This is made of tin, and has four sides, narrowing towards the top; and attached to each side is a wire frame to hold the bread. The toaster is placed upon one of the burners of a gas-stove or on a small gas-ring; and the sides, which are covered with small holes, soon become hot. Inside the framework there is a hood on which the gas directly impinges; and in addition to this the bread is kept well away from the sides of the toaster.

The Unsuccessful East Sussex Issue.

The Directors of the East Sussex Gas Light, Coke, and Water Company, Limited, are meeting with ill-success in angling for weak-brained persons to take up 776 six per cent. preference shares of £5 each, and 971 ordinary £5 shares (unrestricted, be it marked, as to dividend). A batch of prospectuses was issued a few days since, inviting applications for the shares on or before Oct. 7; and the bait of a quarter's interest to Sept. 29 is continued. That bait looks fishy; and it is obvious it has not succeeded in hooking many simpletons on this occasion.

MIDLAND JUNIOR GAS ASSOCIATION.

The Opening Meeting of the Fourth Session of the Midland Junior Gas Engineering Association was held at the Birmingham Technical School last Saturday—the chair being taken at the commencement of the business by Mr. W. E. Caton, of Derby. Subsequently, the incoming President (Mr. James Hewett, of Birmingham) delivered his Inaugural Address; and Mr. F. J. Ward, of Knowle, read a paper entitled, "Retort-House Work and Practice," the discussion of which was adjourned until the December meeting. Among those present was Mr. H. Rothwell, the Senior Vice-President of the London and Southern District Junior Gas Association.

The Late Sir George Livesey.

Mr. Caton remarked that, before commencing the business of the meeting, he would like to say a few words about the late Sir George Livesey. It was with sincere regret that they read of Sir George's death, which occurred at his residence at Reigate on Sunday. As the members were no doubt aware, the funeral was to take place that (Saturday) afternoon. This loss to the gas industry would be greatly deplored, as during the past thirty years he had been its central figure. It was not necessary for him to detail Sir George Livesey's career, as no doubt most of those present had read the account which appeared in the current number of the "Journal of Gas Lighting." Suffice it to say that he would long be remembered by the gas industry among other things as the pioneer of the co-partnership or profit-sharing scheme which had worked so well in connection with the South Metropolitan and South Suburban Gas Companies, and which had been adopted with success by several other gas companies throughout the kingdom. The least, he thought, they could do would be to pass a vote of sincere condolence with Lady Livesey in the great bereavement she had sustained, and ask the Secretary to communicate it to her. He moved this.

The vote was immediately passed; the whole of the members rising silently in their places.

Changes of Officers.

Mr. Caton said that since the annual general meeting in March last, when the officers were appointed for the ensuing year, Mr. J. H. Willoughby had been compelled to resign the post of Senior Vice-President to which he was then elected, in consequence of his having been chosen for the position of Manager of the gas-works at Santos, Brazil. He still, however, remained a member of the Association. The Council were empowered by the rules to fill any vacancy that occurred in that way between the meetings, and they had on this occasion done so by appointing Mr. A. O. Jones, of West Bromwich, Senior Vice-President, and Mr. R. S. Ramsden, of Burton-on-Trent, Junior Vice-President, while Mr. Douglas Cooke, of Smethwick, had been elected to fill the vacancy thus occurring on the Council.

The New President.

Mr. Caton remarked that he now came to the most pleasant part of his duty, which was to call upon Mr. Hewett to take the chair. He felt confident he would be only voicing the opinion of all the members when he said that Mr. Hewett had well earned the position he was about to fill. From the commencement he had been Secretary; and thus, in addition to his labours over the inception of the Association, the bulk of the work during the past three years had fallen upon his shoulders, and had been performed most successfully.

Mr. James Hewett (Birmingham) then took the chair, amid applause, and at once proceeded to deliver the following

INAUGURAL ADDRESS.

I thank you most heartily for the honour you have done me by electing me President for the session we now enter upon. Your action is sincerely appreciated by me; and it will be my endeavour to carry out the duties involved in a manner worthy of the Association. Following such gentlemen as the Past-Presidents, the task is not an easy one; but with your kind help and sympathy, I feel certain that the high standard of excellence which has always been characteristic of the Association will be maintained. The programme is a splendid one—including as it does a most welcome paper by one of our honorary members—Dr. W. B. Davidson—and with the co-operation of the members, the session promises to be another successful one.

At the present time, we are confronted with the knowledge that after Dec. 31, 1913, no waggons will be allowed to run upon the railways in Great Britain which are not fitted with spring buffers. In the absence of reliable information, it is only possible to approximately arrive at the present number of dead-buffer waggons. At a low estimate, they probably aggregate 15 per cent. of the total number of waggons in use. Casual observations of the composition of mineral trains, cannot fail to bring home to one the fact that they still form an appreciable proportion of waggons running in mineral traffic. Self-contained spring buffers may be substituted for dead buffers, provided the waggons comply with certain provisions, such as the possession of a continuous draw-bar, &c. The expenditure entailed by this alteration is not large—probably £5 per waggon would suffice to effect the conversion. Upon the predetermined day, few dead-buffer waggons will be under 30 years of age; and in many instances their condition will not warrantthis small expenditure—much more the larger amount entailed by the conversion of waggons not complying with the specified provisions. In consequence, a large number of waggons will be withdrawn; and as there is no reason to suppose that the present number of waggons is excessive, and provides a surplus sufficient to meet the depletion, it behoves all interested to carefully consider the matter, and to take the necessary steps to ensure a continuance of the balance in supply and demand. The quantities of coal, coke, &c., rail-borne to and from gas-works is so considerable that circumstances tending to affect conveyance claim the serious attention of every gas engineer. At the last annual meeting of the Institution of Gas Engineers, Mr. W. Doig Gibb, M.Inst.C.E., in his Presidential Address, pointed out the advantages to be obtained by employing larger waggons than are now in general use. In a year or two, a large number of new waggons will have to be constructed to take the place of the discarded dead-buffer waggons; and it is safe to say that a considerable proportion will be of larger capacity than is now general. Many members are aware that the City of Birmingham Gas Department have had the matter under consideration, and at the present time have a small number of 20-ton hoppered steel waggons running in connection with their coal traffic. In his Presidential Address last session, Mr. W. E. Caton placed before the Association information relating to new and up-to-date plant, in the evolution of which he had been actively engaged. Following his lead, I propose—the time being opportune—to bring to your notice particulars of these 20-ton waggons, and the circumstances leading to their introduction.

In the year 1895, the hoppered type of waggon was first introduced into the Birmingham Gas-Works by Mr. Charles Hunt, with the object of dropping coal into the receiving hopper at the foot of the elevator—connected with the stoking machinery—at the Windsor Street works. A saving in the cost of conveyance and a reduction in the time occupied in unloading was anticipated by the adoption of this type of waggon; and a twelve months' experience of the working of 50 such waggons resulted in the realization of this expectation. The suitability and success of the type warranted the purchase of further waggons; and by the autumn of the following year, no less than 300 of them were in use at the various gas-works of the Birmingham Corporation.

The waggons are similar in design and construction, and all conform to the following description: Length over buffers, 19 feet; width over-all, 8 feet; height above rail-level, 9 feet; wheel-base, 9 feet. The tare weight is 6½ tons, and the nominal capacity 10 tons of coal; but what with the different classes of coal carried, and at times indifferent loading, the weight of coal dealt with, over a long period, averages 9 tons 12 cwt. per waggon per journey. The body is of the "hoppered" type, and constructed of steel throughout. The plating is $\frac{7}{16}$ inch thick, framed with angles, and stiffened by angle and T bars. The hopper is 16 feet long, by 8 feet wide at the top. The sides are slightly sloped; and the ends are vertical for a depth of 10 inches, and then incline towards the centre, at an angle of 36° with the horizontal. Two openings, each 2 ft. 6 in. by 2 ft. 4 in. are arranged at the bottom of the hopper; and a sliding-door, the subject of a patent taken out by Messrs. Hunt and Shackleford, is provided for each opening. The doors travel on horizontal guides fitted with rollers. The actuating gear consists of a rack, pinion, and spur gear; and by means of a removable handle, the doors can be opened and closed independently—one from each side of the waggon. In addition, the majority of the waggons have hinged doors on both sides. The under-frames are of steel, 16 feet long by 9 feet wide over-all. The solebars, headstocks, middle bearers, and longitudinals are formed of channel bars, and the trimmers and diagonals of angle bars. Each end is stiffened by a plate $\frac{7}{16}$ inch thick over the full width of the frame for a distance of 2 ft. 3 in. from the headstocks. The usual practice for 10-ton flat-bottom waggons was followed as closely as possible in the design of the axles, wheels, buffing and drawing gear, brakework, &c., to the satisfaction of the Clearing House Committee.

I now propose to submit figures showing the relative costs of delivering coal to the receiving-hoppers under the railway lines at the Birmingham Gas-Works in "flat-bottomed" and "hoppered" waggons, exclusive of haulage, maintenance of sidings, and other charges common to both types. The hoppered waggons cost £75 each; and at the time they were purchased, the lowest offer received for flat-bottomed waggons with steel frames and wooden bodies was £60 each. The quantity of coal carried (150,000 tons per annum) is based on 300 waggons, each making one inward and one outward journey per week—the average over a number of years for waggons running between Birmingham and the Yorkshire and Derbyshire coalfields. For depreciation, I have taken the "life" of both classes of waggon at 30 years. This, of course, is debateable; but any member using the figures can adjust the matter to comply with his own particular opinion. By "life," I mean the commercial, and not the ultimate, existence of the waggon, allowing for extraordinary damage resulting from causes other than fair wear and tear, and deducting for the period when the running of the waggon results in abnormal expenditure for repairs and renewals. The maintenance charges comprise the cost of repairs, renewals, painting and lettering—every two years in the case of steel waggons and every three years for wooden

waggons—adjusting, greasing, and oiling. Also all the charges incurred in the stopping, placing in position, and conveyance of damaged waggons, including the whole cost of transhipment of materials. The figure adopted for flat-bottomed waggons is the average yearly cost per waggon obtained from actual expenditure incurred on account of a number of waggons over a period of 30 years. That for the hopper-waggons is arrived at by adding 50 per cent. to the yearly average of the actual cost of this type of waggon over a period of 15 years—viz., £2—thereby providing £4 per waggon for each year of the remainder of its "life."

The actual cost of unloading the coal through the bottom doors of flat-bottom waggons averages 1½d. per ton. The doors of the hopper-waggons are opened and closed by the engine-attendant; and the waggons being self-discharging, no additional charge is incurred in this respect. The costs are as follows:—

300 10-ton waggons, with steel frames and flat-bottom bodies, at £60 each = £18,000.

Interest on £18,000 at 3½ per cent.	£630
Depreciation $£\frac{18,000}{51{\cdot}62}$	349
Maintenance at £2 per waggon	600
Unloading 150,000 tons at 1½d. per ton.	703
Cost per annum	£2,282
Cost per ton of coal, 3·65d.	

300 10-ton waggons, with steel frames and hoppered steel bodies, at £75 each = £22,500.

Interest on £22,500 at 3½ per cent.	£788
Depreciation $£\frac{22,500}{51{\cdot}62}$	436
Maintenance at £3 per waggon	900
Unloading	—
Cost per annum	£2,124
Cost per ton of coal, 3·39d.	

From these figures, it will be seen that the adoption of the hoppered type of waggon resulted in only a small annual saving; but other advantages obtained—such as expeditious unloading and lessened risks to men engaged in closing the doors—must be borne in mind. These results compare very favourably with the charges made by collieries for coal delivered in their waggons, and with the cost of hired waggons, which, in the same traffic, and adding for unloading, average 6·84d. and 4·72d. respectively per ton of coal.

Subsequent experience of the hopper system only served to substantiate its value as a carrying medium for gas-works. In designing the new coal-gas works at Nechells (which the members had the opportunity of viewing in 1905), Mr. Henry Hack—upon whose staff, I may say in passing, I had the satisfaction to be for upwards of ten years, and in whose service I gained much of my knowledge on this subject—arranged the buildings and plant with a view to the use of hopper-waggons, not solely for the coal traffic, but also for lime and oxide. In 1899, as the works were approaching completion, tenders were obtained for 200 ten-ton hopper-waggons; but the most favourable offer being about 20 per cent. in excess of the prices previously paid, the purchase of more waggons was deferred, in the hope of securing more favourable terms. Another application in the year 1901 meeting with even less favourable results, Mr. Hack, in view of the satisfactory reports appearing in the Press as to the working of large-capacity waggons in America and other countries, turned his attention to the possibility of employing large-capacity hopper-waggons.

Owing to the clearances provided in tunnels, bridges, and other permanent structures in connection with the railways of this country, no appreciable addition can be made to the width and height of waggons. Any considerable increase of capacity of a waggon must, therefore, be arranged in the direction of its length. An increase in the capacity of a waggon does not necessitate a proportionate addition to its tare weight, nor a greater distance from the body to the extreme end of the buffer. That is, the ratios of the tare weight and the length of waggon to the load decreased as the capacity of the waggon increases; and so the advantages accruing from the use of larger waggons are mainly attributable to these reductions. Briefly, the advantages per ton of material carried are as follows:—

1.—The first cost of the waggon and the yearly charges for maintenance are reduced.
2.—The weight to be hauled by the locomotive is less; and in the gas coal and other traffic, in which the waggons usually travel the return journey empty, the value of this reduction is materially enhanced.
3.—The capacity of sidings is increased. This is especially advantageous in works where accommodation is limited, and the operations of shunting are performed with difficulty.
4.—Working expenses are reduced.

Except for the slight increase of 1 ton or 2 tons in capacity, and improvements in design and construction, the waggon of to-day remains what it was in the early fifties. With such tangible benefits and possibilities in view, one naturally wonders why the present limited dimensions prevail. That this is not due to ignorance is evident from a perusal of literature appertaining to railways, inasmuch as waggons of larger capacity were advocated for use in this country more than fifty years ago. Possibly the reason may be ascribed to the conservatism of the country and its aversion to any radical departure from established practice.

Waggons 30 to 35 feet long over the buffers (about twice the length of 10-ton waggons), if provided with suitable buffers and draw-gear, will negotiate curves of 1½ chains radius. The gross weight of such waggons would be, when fully loaded with coal, from 40 to 50 tons each; and correct weighings can be obtained upon existing machines of 25 tons capacity and upwards, by ascertaining the weight on each bogie separately. Increasing the capacity of a weighing machine does not entail a great amount of expenditure. Where it is only necessary to strengthen the swings and fit a new index, the cost would be about £20 per machine; or taking a case where the triangular levers, swing, end-frames, girders, and index have to be renewed, the cost should not exceed £50 per machine. The existence of small weighing machines, therefore, need not be a deterrent to the introduction of larger waggons.

In many collieries and gas-works considerable expenditure will be necessary to adapt bridges, sidings, turn-tables, and other plant to suit waggons of this length; and probably some long time will elapse before such waggons are used to an appreciable extent for the conveyance of gas coal. This, however, is going to the extreme; and beyond doubt a considerable increase can be made in the capacity of waggons without entailing any additional expenditure other than the outlay on the rolling stock.

I must here remark that, arising out of the Board of Trade inquiry into the circumstances connected with the collision between an excursion train and an empty coal-waggon in 1885, attention was called to the frequency of accidents to goods waggons. It was suggested, seeing how terrible may be the consequences of a very common accident to a goods waggon, that too great care could not be taken in the construction and maintenance of such waggons. With this object in view, the Board of Trade suggested that all rolling stock should belong to the railway companies, or, as an alternative, that every waggon should bear a label showing that it had been examined and passed for running by one of the railway companies. As a result, the latter alternative was adopted; and in 1887 the Railway Clearing House Committee issued a standard specification relating to the construction and repair of all new waggons built for private owners to run upon the railway companies' lines. Under this specification, the company's officials examine all new waggons, and attach a register plate to those constructed in compliance with its provisions. Without this plate, no waggon is permitted to run on any company's lines. Amended standard specifications appeared at intervals; but up to 1901, no provision had been made for the construction of coal-waggons of larger capacity than 10 tons.

Nevertheless, reports were to hand of the running of 30-ton waggons on the North Eastern Railway Company's system; and the use of similar waggons in our coal traffic appeared to be within easy distance. Such, however, did not prove to be the case, as the Midland Railway Company, upon whose lines the waggons would be "at home," in reply to an inquiry, stated that these large waggons were owned by the Railway Company using them, and employed in a special traffic. They (the Midland Railway Company) were not disposed to sanction the construction of similar waggons by private traders. The matter was not allowed to drop there. Correspondence was maintained, interviews took place, drawings and information were supplied, and the request for permission to construct larger waggons was pressed with vigour.

Early in 1903, the Midland Railway Company, having in the meantime constructed fifty 30-ton waggons for the conveyance of coal for their locomotives, intimated that the standard specifications were shortly to be issued for the construction of similar waggons by private owners. This notification practically confirmed the conviction which had been formed of the attitude of the railway companies with regard to the introduction of larger waggons; and it was now palpable that sanction for the construction of such waggons would be withheld from private owners until suitable regulations could be drawn up, based on working experience. Taking into consideration the responsibilities incurred by such a radical departure from long established practice, this course was not to be wondered at; and it was therefore decided to postpone further action until applicable specifications had been issued by the Clearing House Committee.

These were not long in appearing. Specifications and drawings for 12, 15, and 20 ton waggons were issued in May, 1903; and for 30-ton waggons, two months later. The drawings related solely to flat-bottom waggons; but the specifications contained a provision to the effect that private owners might build the bodies of waggons so as to best suit their own requirements, provided the dimensions and stipulations set forth in the specifications were strictly complied with—also subject to a working drawing being submitted to, and approved of by, the waggon superintendent of the railway company upon whose lines the waggons are to be "at home."

A hopper-waggon of 30 tons capacity was first considered; and though a large number of designs were evolved, the only one to comply with the standard specifications, and at the same time suited to the existing conditions at the collieries and gas-works, was for a waggon with a body consisting of three hoppers, and consequently three points of discharge. Such a waggon would have to be moved three times to discharge its contents into the receiving-hoppers placed over the coal-crushers—a most undesirable proceeding.

The railway companies refusing to sanction any departures

from the standard specification, attention was given to the construction of a waggon of 20 tons capacity. Drawings and specifications were prepared, and provisionally approved by the railway companies, with a view to the construction of a sample waggon for their inspection. The order for the waggon was placed in July, 1905; but owing to the unusual proportions of the various parts, some considerable time was taken in the construction, and it was not completed until the end of that year. The waggon was submitted to the Railway Clearing House Committee, who, after the execution of several minor alterations, approved the sample, and sanctioned the construction of further waggons.

A short trial at the gas-works, however, was sufficient to reveal serious defects in the design, particularly with regard to the discharge of the coal, which could only be performed by probing. With the aid of two men, this operation occupied three to four minutes for the discharge of 18 to 19 tons of coal. This defect was brought about by the stipulation in the standard specification making it compulsory to have longitudinal members in the underframe and draw-gear continuous between the headstocks. The disadvantages of this method of construction in the case of hopper-waggons had not been overlooked; but an application to the railway companies for the amendment of these provisions was unsuccessful, and withheld until the truth of the contention was demonstrated. Sanction having been obtained, the longitudinal and continuous draw-gear were removed. The rigidity of the under-frame was maintained by plating the ends between the body and solebars; and independent drawbars were arranged at each end of the waggon. These alterations entirely remedied the defect; and the contents of the waggon were discharged, without probing or other assistance, in about one minute.

The capacity of the waggon was found less than contemplated. With careful loading and trimming, it was only 18 tons. The possibility of an increase presented difficulties. The width of the waggon was the maximum permitted by the standard specification; an increase in its length would necessitate a longer wheelbase, which was undesirable; and an addition to its height would restrict its use, owing to the insufficient headroom under the screens at many of the collieries whence our coal is obtained. However, the difficulty was partly overcome by arranging the stiffeners on the inside of the side-plates of the body, instead of on the outside as heretofore. By this alteration, and without increasing the over-all dimensions, the capacity of the waggon was augmented to about 19½ tons, which, under the prevailing conditions, was considered satisfactory. The altered position of the stiffeners did not interfere with the free discharge of the coal, and improved the appearance of the waggon, which had previously been likened to a canal boat on a lorry. Several minor defects had been under notice and remedied; and the sanction of the Clearing House Committee having been obtained, thirteen further waggons were constructed in accordance with the amended sample.

These waggons are 23 feet long over the buffers, 8 ft. 3 in. wide over-all, and 9 feet high above the rail-level, with a wheel-base of 10 ft. 6 in., and a tare weight of 8½ tons. The bodies are of the "hoppered" type, and constructed of steel throughout. The plates are $\frac{3}{16}$ inch thick, framed with angle-bars and stiffened with angle and tee bars. The hopper is 20 feet long by 8 feet wide at the top. The sides and ends are vertical for depths of 4 ft. 6 in., and 3 ft. 6 in. respectively, and then taper inwards; the minimum inclination with the horizontal being 40°. Two openings, each 3 feet by 2 ft. 2 in., are arranged at the bottom of the hopper; a door, fitted with rollers and travelling on horizontal guides attached to the hopper, being provided for each opening. The actuating gear consists of a chain with the ends attached to either side of the door; the two forming an endless band. The chain works upon two sprocket wheels—one fast the other loose. The former is rotated by spur gear; manual power being applied by means of a removable lever, one end of which fits upon the squared ends of the pinion-shaft. The arrangement is such that each door can be opened or closed from either side of the waggons. Three complete revolutions of the handle are required to fully open the door; and the stream of coal may be cut off when any desired portion of the load has been discharged.

The under-frames are of steel, 20 feet long by 8 feet wide over-all; and channel sections are utilized for the sole-bars, headstocks, middle bearers, diagonals, and trimmers. Each end is strengthened by a plate, $\frac{5}{16}$ inch thick, across the full width of the under-frame for a distance of 3 ft. 9 in. from the headstocks. Suitable holes are arranged to facilitate access to the buffing and draw springs. The axle guards and boxes, bearing springs, wheels, and axles are in accordance with the standard specification, as are also the buffing and drawing gear, with the exception that helical springs are arranged for the buffers, and independent draw bars are provided at each end of the waggon. The waggons are equipped with Peart's patent brakework. This is arranged on one side of the waggon only, but can be applied from both sides. The brake-blocks are suspended from the under-frame—two to one wheel of each axle—and are manipulated by means of a rocking shaft and a system of levers and pull-rods. With this type of brake, the wheels are gripped independently, and the thrust between the axles counteracted. Upon being applied, the axles are not pressed against the bearings; consequently undue wear of the journals is prevented, and the risk of dislocation of the axle guards is thus minimized. The waggons were designed by Messrs. Sheffield and Twinberrow, of Newcastle-on-Tyne.

I now propose to submit figures showing the relative costs of carrying coal in 10 and 20 ton hoppered-waggons under the conditions named in the comparison of flat-bottomed and hoppered waggons. The actual cost of the 20-ton waggons was £141 each. At the time these were purchased, quotations were obtained for 10-ton hoppered waggons; and the lowest offer received was £93 each—24 per cent. more than the price paid for similar waggons ten years earlier. The cost of materials and labour had risen since 1895, but not to the extent represented by this increase. The explanation that occurs to me is that the inflated price was mainly attributable to the reduced competition consequent upon the amalgamation of a large proportion of waggon builders since the time that prices were last obtained. At these prices, taking the average yearly cost of maintenance of the 20-ton waggons as £5—that is, 25 per cent. more per ton of material in the waggon than in the smaller size—the cost of carrying the coal by the two sizes of waggons is as follows:—

28 10-ton waggons, with steel frames and hoppered steel bodies, at £93 each = £2604.

Interest on £2604 at 3½ per cent.	£91
Depreciation £$\frac{2604}{51{\cdot}62}$	51
Maintenance at £3 per waggon	84
Cost per annum	£226

Cost per ton of coal, 3·87d.

14 20-ton waggons, with steel frames and hoppered steel bodies, at £141 each = £1974.

Interest on £1974 at 3½ per cent.	£69
Depreciation £$\frac{1974}{51{\cdot}62}$	39
Maintenance at £5 per waggon	70
Cost per annum	£178

Cost per ton of coal, 3·05d.

In addition to this saving, the larger-sized waggons occupy 40 per cent. less siding accommodation (train length) than the smaller waggons for equal quantities of coal dealt with; and the tare weight of the 20-ton waggon is but 43·6 per cent. of the load weight, as compared with 67·7 per cent. in the case of the 10-ton waggons. In traffic where the empty waggons are returned free of charge, the reduction in the ratio of the tare weight to the load is an important consideration, and will be better appreciated when placed in this manner: For every 1000 mile-tons of goods of paying weight, there is, when 20-ton waggons are employed, 871 mile-tons of tare, or non-paying weight, as compared with 1354 mile-tons when using 10-ton waggons. The benefits to be derived by private owners consequent upon this increase in the ratio of the paying load to the non-paying load is dependent upon the extent of the reduction made in the railway "rate." This at the present time is not likely to be considerable. When the use of larger waggons becomes more general, by the united action and persistent application on the part of interested parties, better results may be expected, and more favourable rates looked forward to with confidence.

The whole of these 20-ton waggons had been put into the main-line coal traffic by the end of August last year. Within a very short time, difficulties were experienced with the journals. Instead of improving after a journey or two, matters went from bad to worse; and the waggons were constantly stopped owing to heated journals. At times, the white metal lining of the bearings was melted. The journals of these waggons are 10 in. by 5 in., as compared with 8 in. by 3¾ in. for the 10-ton waggons; the bearing area provided per ton of pressure being practically the same for both sizes. The lubricant employed, however, is not the same; grease being used for the smaller waggons and oil for the larger ones. The use of oil for the latter was compulsory, in compliance with the standard specifications, which do not permit the use of grease for non-tipping waggons of a greater capacity than 12 tons. Various mixtures of white metal were tried for the linings of the bearings; and horse hair and several kinds of patented packing were substituted for the cotton waste in the axle boxes—but all to no purpose. Attention was then directed to the use of spring lubricating pads, in lieu of packing; but the design of axle-box did not lend itself to any known type of pad. Eventually, a suitable pad was devised by Mr. J. T. Hardwick, the Waggon Inspector to the Birmingham Gas Department, and fitted to the waggons. The application of these pads has been attended with most satisfactory results; and trouble from heated journals is now a thing of the past.

As is only to be expected, the running of these large waggons has brought to light one or two defects. These, however, are not of a serious nature. Possessing the knowledge that can only be obtained by practical experience, these defects can be provided against in the design of further similar sized waggons, which will then compare most favourably, as regards both reliability and efficiency, with the smaller waggons still in general use. No difficulty has been experienced upon the sidings at the terminal yards in negotiating the curves, some of which are less than 1½ chains radius; and no expenditure has been incurred for alterations to the weighbridges—one axle being weighed at a time on 20-ton machines. Strengthening of bridges and other structures was unnecessary, as though the rolling load of the 20-ton waggons is slightly more than that of the locomotives in use, the additional stress produced does not appreciably reduce the factor of safety allowed for in their design.

The largest waggons provided for in the standard specifications are of 40 tons capacity. These and 30-ton waggons must be arranged with bogie carriages. Such provision is, of course, indispensable; but its application widens, to a greater extent than appears from a superficial comparison, the gulf between these sizes and the larger of the two I have referred to.

Much time and great care will have to be exercised in the selection of a design, and when the waggons are put into traffic, every consideration and allowance must be given for difficulties almost inseparable from all departures from established practice.

Votes of Thanks.

The Hon. Secretary (Mr. H. E. Temple, of Birmingham) said that, in rising to propose a vote of thanks to the President for his address, he must compliment him, not only upon having chosen for it a subject which was of most vital importance to the gas industry—the method of transport of supplies, and the means of cheapening it—but upon the able manner in which he had dealt with the question. They all felt that it had been a most interesting and instructive address. It treated of a side of the industry that very few of them paid attention to; and they were lucky to have had such an address.

Mr. R. S. Ramsden (Burton-on-Trent), in seconding the vote, said he supposed a good number of them had now their own waggons for carrying coal; and the manner in which Mr. Hewett had explained the advantages and disadvantages of various sized waggons would be most useful to them when deciding what kind they should provide.

The vote having been heartily accorded,

The President expressed his obligation to the members for the way they had received his address. He said it was very difficult to select a subject, unless one fell back upon the stereotyped review of what had taken place during the past year or so. This, however, could be obtained from the Technical Press, and was no doubt read by most of the members. Therefore, as he happened to be connected with the question of the introduction of larger waggons, he thought it would be an interesting matter to bring before them for their future guidance. Before sitting down, he would like to propose a vote of thanks to the retiring President (Mr. Caton), and to Mr. J. H. Willoughby (who would have been Senior Vice-President this year) and the retiring members of the Council. Few words were required from him on behalf of Mr. Caton. They all knew that, in spite of the distance he had to travel, he had been most regular in his attendance at the meetings. The only meeting he knew of that Mr. Caton had missed was the recent one in London; and then it was only because of his absence on the Continent. Mr. Willoughby had been a regular attendant, and had given much attention to the affairs of the Association, which, with the help of such men, must flourish. The two Members of Council had also done all that was in their power.

Mr. Ramsden seconded, and remarked that they were all grateful to Mr. Caton for his work—especially for his Inaugural Address and all that he had done in connection with the visit the Association paid to the Derby Gas-Works.

The vote having been carried by acclamation,

Mr. Caton returned thanks, and assured the members that any slight inconvenience he might have experienced in attending the meetings had been more than repaid by the cordial manner in which they had passed this vote. Mr. Willoughby had done a large amount of work for the Association; and he hoped that at some future time they would have the pleasure of his company again at the meetings.

The President said they would all be pleased to hear that their old friends and originators of the Association, Mr. C. Meiklejohn and Mr. T. Berridge, had communicated to him their regret at not being able to be present. Mr. Caton had referred to the reason—the funeral of Sir George Livesey.

Retort-House Work and Practice.

Mr. F. J. Ward (Knowle) then read his paper on "Retort-House Work and Practice." At its conclusion,

Mr. J. H. Darrah (Birmingham) remarked that, as time had not permitted of the paper being printed and distributed before the meeting, and as it contained many debatable points, it would be an advantage for the members to have an opportunity of studying it before the discussion took place. He therefore suggested that the discussion should be held over till next meeting.

The President said the subject dealt with was so important that he thought the course proposed would be the best.

The adjournment of the discussion was thereupon unanimously agreed to.

The President, in proposing a vote of thanks to Mr. Ward for the paper, said the question he had introduced to their notice was one which it was a wonder had not, owing to its importance, been brought before them previously. He was sure it would lead to a good discussion at the next meeting.

Mr. Caton seconded the vote, which was cordially passed.

Mr. Ward, in acknowledging it, said the paper had been a labour of love, though its preparation was very hurried. He hoped when the discussion came on they would give him a good thrashing, because in so doing they might drop some hints on the matter of his carbonizing plant which would enable him to improve his position. He was paid by results; and therefore if they could show him how to obtain better results, he would be extremely obliged.

RETORT-HOUSE WORK AND PRACTICE.

By F. J. Ward, of Knowle.

[**A Paper read before the Midland Junior Gas Association, Oct. 10.**]

In presenting this paper for the consideration of the members of the Association, I do not propose to offer any new scheme to render large productions of gas for each ton of coals carbonized easy of attainment, but desire to plead for more enlightened and careful handling of the plant as it exists; my observations impressing upon me the fact that in a large number of works—and especially small ones—the best results are not attained by the plant already installed. My remarks will largely treat of retort-house work, and be specially directed to the smaller undertakings. We have been treated of late, in a more or less authoritative fashion, to various addresses, articles, lectures, letters, &c., all launched forth with the object of showing that anyone who is so old-fashioned as to continue to use any hydraulic main and dip-pipes is being hopelessly left behind in the gas production race. I propose to show that it is not always so, but rather that the majority of those who have discarded the old style of plant have done so to cover up some very bad results.

Before dealing with this matter, it is well to consider the question, Are we getting the best results possible with the plant we have? I feel that it is very often the case that the most is not being made of existing plant, owing to the loose, careless, and slovenly way in which carbonizing is being carried on in a large number of works. It has been my painful privilege to inspect retort-houses where coal and coke were mingled indiscriminately on the floor, where the retort-lids and mouthpieces had apparently not been cleaned for ages (the resultant leaks being extensive), with bridge-pipe and ascension-pipe joints mingling tar and gas in conspicuous and odoriferous quantities, and where chaos generally reigned. The working results can be imagined. Previous to accepting my present appointment, I was for several years carbonizing foreman at a medium-sized works "up North," where the foregoing description would not apply, but where most of the stokers vied with each other in keeping everything tidy and clean. The result was that, out of Lancashire coal, up to 11,800 cubic feet per ton of 15½-candle power gas was produced. In my present works, I set up a standard which has been carefully followed, and is maintained by the men without any reminder from me of my requirements. We keep the retort-house as clean as is possible. The tar is removed from the mouthpieces before drawing; the ascension-pipes are carefully augered; and we even sweep the bridge-pipes, the hydraulic mains, and the top of the retort-stack down at least twice each year. This carefulness pervades the whole works; nothing is lost that can be used to advantage.

The selection of coals to suit the plant in existence at the particular works needs very careful attention. If the plant in the condensing and purifying departments is at all deficient, coals should be chosen which do not yield an undue amount of naphthalene. My experience is that coals which contain a large amount of naphthalene are those of a very dry and almost non-caking character. Then if the ascension-pipes are short, coals should be eschewed which contain but little tar, and preference be given to tarry ones. Care taken in this respect will prevent stoppages from occurring so often. It may be of interest to state that at the Knowle works stoppages in the ascension-pipes are almost unknown. We seldom get one; but when we do, we invariably find that the reason is a prolonged use of a coal less tarry than another kind we employ. Our ascension-pipes are all very short, owing to limited head room. Coals should never be received which contain any appreciable quantity of bats or refuse; this being a fruitful source of clinker in the producers, in addition to being unproductive of gas, and oftentimes containing a large amount of sulphur.

The care of producers should be a consideration of great interest. If the retort-house is a ground floor one, with the producers situated in a cellar, the necessary attention to the formation of clinker is often greatly neglected. After cleaning has taken place, the grate surface is left to take care of itself for several hours, large clinkers are formed, and the operation of cleaning has again to be resorted to. Cleaning should be avoided and prevented as much as possible, for not only is the brickwork damaged more or less in the process, but the removal of the fine pieces of coke at the bottom of the producer causes the working of the bed to take some considerable time to settle down to its normal state; the consequent result being considerable loss of heat during each period of such disquietude and unsettlement. I make it a rule that the producers are "pricked" up with a pricker at least 15 inches long every 2½ hours or so. By doing this, we never clean a producer in the ordinary acceptation of the term. False bars are never inserted. The small pieces of clinker which do not fall through the bars are gradually worked to the front and removed between the drip-plates. It is never necessary for me to see that the fires are being regularly attended to; the workmen being too conscious of their interests in this respect to allow a producer to get into such a state as to require the withdrawing of the bars. The monetary saving in re-lining the producers is considerable; a proof being that we have just plastered up with fire cement some slight caving in a producer which had been working for 21 months continuously—re-lining being quite unnecessary. In designing producers, care should be taken to ensure a sufficient

grate area to prevent too quick passage of the air supply. I am acquainted with a case where only 72 square inches were allowed for each 10 feet retort to be heated—a totally inadequate allowance. The producers have to be cleaned in this case about every twelve hours.

It is the practice in most works to regard the air-slides and dampers as being very sacred, hardly to be looked at, much less touched, after they have been once set for working. We do not hold such views, but partially close them down during all periods when not making gas, and also at night when no night man is on duty. Experience has taught us to fix the positions to a nicety, so that the heats are as good when restarting as when we finished. Carbon should be kept off the retorts. I cause mine to be cleaned if it is ¾ inch thick; and the removal is then easy.

I am not an extremist in the matter of thick or thin charges; my experience being that from a retort charged three-quarters full the best results can be obtained. With thin charges, the gas is decomposed so greatly that trouble is bound to ensue from lamp-black, pitch, or naphthalene; while thick charges are so difficult to draw, and the gas as evolved from the inner portion becomes decomposed almost as much as in the case of the thin charge. Extremes in this case certainly do meet. The three-quarter charge with horizontal retorts—and it is with them alone I am dealing—is, in my experience, the best.

Considerable controversy has ranged round the subject of Hydraulic *v.* Dry Mains. Each method has its advocates; but the numbers on each side are hard to determine. I have never found to be real the difficulties and disadvantages which we are told do exist with the use of hydraulics. In all my experience—which is not a small one—I have never been associated with a pitched hydraulic, neither have I found that my gas has been low in candle power on account of using hydraulics and dip-pipes. On the contrary, I have frequently been comforted to know that I had them in use when my exhauster has been stopped from any cause whatever. I endeavoured some years ago to adopt a bye-pass arrangement between the bridge-pipes and the hydraulic main, to allow the gas to pass into the hydraulic without going through the seal. This consisted of a very short length of 2-inch pipe, with a full-way plug-cock controlled by a lever. The result was scarcely satisfactory. The pipes were often choked, and the advantages were so small (if any) that I reverted to the old arrangement with no reluctance.

I have seen, too, at works which I have visited, and which possessed dry mains, some very startling sights, sufficient to cause one to decide against such methods of working. In the works up North which I mentioned previously, the mains were all hydraulics; the dip-pipes being sealed in tar and liquor as formed in the mains. An extraordinary fact in addition was that, instead of every effort being made and plant installed such as tar towers, &c., to rid the mains of tar, extra tar was run in in a constant small stream, to unite and mingle with, and dissolve, any thick tar which might accumulate and form tar of good liquid consistency. This method of working was in direct conflict with that which is being advocated—viz., removing the tar by columns and swilling out the hydraulics with liquor periodically. The hydraulics were joined together throughout their entire length of ten beds—division plates being inserted to separate the sections, and each plate being pierced with a rectangular hole sealed in the liquids. This allowed the liquids to pass along to the ends, where it escaped by running through regulating weir-valves. In my present works at Knowle, until three months ago the hydraulic main was joined together throughout its entire length, the dip-pipes were sealed in the liquids as deposited, and the overflow took place at the end, passing with the gas to near the condensers, where it was separated. I have now sectionized the hydraulic main, and inserted separate outlet-pipes joined to one common main; the seals being regulated by 8-inch weir-valves, and the gas and liquids passing away together to near the condensers. The dips are sealed just sufficiently to prevent the gas passing back when the exhauster is at rest and the heaviest holder at work. This I find requires to be ½ inch. I have never had the slightest difficulty with either of the arrangements; and the chief reason why I adopted the present plan was to enable me to work closer with the exhauster than I was previously able to do, owing to the exhauster being in communication with all beds, whether working or not. I do not propose to adopt any other means of withdrawing the tar, as it would be a totally unnecessary expense.

Retort-house governors have of late found numerous advocates who vow with great assurance and earnestness that all evils which exist can be cured by their use. I have been tempted to say that they vow that they cure evils which do not exist; but I will be charitable, and refrain. I fear that at the works where they have been adopted there must have been some very faulty working or loose screws. I must admit that I can only see in a very minor degree why they are required, unless it be in works where several retort-houses are at work, and the length of travel to the exhauster is great, and main arrangements very dissimilar. The frequent stoppages of gas manufacture which must occur to clean off the valves or cones the thick tar which is bound to accumulate, or the putting the governer out of action for the same purpose, we hear very little about. That some arrangement is oft-times necessary to take up the pulsations of the exhauster—especially if it is large and two-bladed—I admit. This can be done by pulling the gas through a Pelouze extractor, or by having a small holder and tank, communicating with which is a pipe of fairly large diameter, and attached by a tee-piece with the foul main. The holder would rise and fall with the movement of the blades of the exhauster, and a steady gauge would be shown in the hydraulic main. Only a limited quantity of fresh gas would pass into the holder; and the condensed liquids could be easily withdrawn when necessary. This arrangement could be fixed close to the exhauster.

In my own case, the exhauster is driven by a gas-engine coupled directly to the exhauster; the compensating arrangement being a governor in communication with the inlet-pipe, which governor is counterbalanced and attached to a butterfly wing valve on a fairly large communication-pipe between the inlet and outlet pipes. This arrangement is entirely satisfactory, both from the working and economical points of view. The governor of the engine is not used; but the speed is constant, owing to an impulse being given every complete cycle. Gas-engines are, however, subject to one disadvantage—viz., that having an impulse every second revolution, or more if the governor is at work, that impulse is shown very markedly on the inlet-side. This should be overcome by having the communication-pipe of the compensating governor of large size, thus causing the governor to act quickly, and the pipe between the inlet and outlet pipes as short as possible. The valve will then open with each impulse, and the impulse will not travel very far. The hydraulic main gauge will be at its steadiest point when the make is largest. I find that the gauge is very steady when connected directly to a retort in action—scarcely any impulse being shown.

Correspondence in the Technical Press has at times taken place on the desirability of paying bonuses to retort-house men for increased production of gas per ton of coal over a fixed point. I am not in favour of such a course; for I consider that any man who does not do his best without being stimulated by a bonus dangled before his face, should have his "marching orders." There are also many causes contributing to increased or decreased yields over which the men have no control; and if bonuses are to be paid, it would only be just for deductions to be made should the make fall below the fixed point. I can well imagine the state of things were such to be the case. I believe that men should be paid a good living wage—such wage to be above the general run of wages in the neighbourhood for work entailing a similar amount of labour, sufficient to keep a man, wife, and family in comfortable circumstances, and to cause him to ponder before quitting the work for any other. Some men, however, have high notions of life, and live with their belongings in higher spheres and under more luxurious conditions than their work justifies. These are the men who are always requiring their wages to be raised.

In bringing this rather rambling paper to a close, you will be curious to know what the results of my methods of working are at the works of the Company with which I am connected. I therefore give you the figures relating to the year ended Sept. 30, 1908, and also for the last six months of that period. I would ask you not to be too critical, but to bear in mind the smallness of the works, the fact of hand drawing and charging, and that the exhauster is often idle. It is not worked when only one and sometimes two retorts are charged. It is never started till two retorts are charged, and in summer time we stop it twice a day; while owing to its being driven by a gas-engine, it is often left for hours, and now and then pulls up through overheating, and is not discovered for some time.

The coal used for the complete year was 770 tons, and the gas produced was 9,067,800 cubic feet, which is a yield of 11,776 feet per ton. For the period of six months, the coal used was 274½ tons; and the gas produced was 3,300,000 cubic feet, which is a yield of 12,021 feet per ton. The quality ranged from 15 to 16 candles; and the coal used was fair South Yorkshire and North Staffordshire nuts, neither of which could be called first-class. I may add a word of explanation as to the reason why the make for the twelve months is lower than that of the six months—and that is, we used a large quantity of old-stock coal, chiefly Derbyshire, and bought at least six years ago. We carbonized this during the first six months, owing to the high price we were paying for current supplies—knowing that we should be able to replenish our stock at lower rates. I feel confident that we can now maintain a standard of 12,000 cubic feet very comfortably. Although not bearing directly on the subject of the paper, I may add that during the above-mentioned periods the gas accounted for has been 11,265 and 11,500 cubic feet per ton respectively. These figures show that the registration of the makes has been correct.

My question to you now is: Why should I adopt dry mains, or anti-dips, or displacing chambers, or tar-towers, or foul main governors? Should you show me that I can increase my make by at least 500 cubic feet per ton by the use of any of the foregoing appliances, I shall be prepared to adopt them. Meantime, I propose jogging along in my old-fashioned, humdrum style.

The discussion on the paper was adjourned until the December meeting of the Association.

The death occurred at Plymouth, last Thursday, at the age of 63, of Lady Bellamy, wife of Sir Joseph A. Bellamy, the Chairman of the Plymouth and Stonehouse Gas Company. The deceased lady, who had been in failing health for some time, was highly esteemed in Plymouth, of which borough Sir Joseph was Mayor in 1901-2, when the King visited the naval port.

FURTHER EXPERIMENTS UPON GAS-PRODUCER PRACTICE.

By William Arthur Bone, Ph.D., D.Sc., F.R.S., Professor of Applied Chemistry (Fuel and Metallurgy), Leeds University; and Richard Vernon Wheeler, D.Sc., late Dalton Scholar and Fellow of Manchester University.

[Extracts from a Paper read before the Iron and Steel Institute, Oct. 1.]

In our previous paper on "The Use of Steam in Gas-Producer Practice,"* it was contended that the admixture of more steam with the air-blast than corresponds with a saturation temperature of from 60° to 65° C. is not conducive either to higher thermal efficiencies or to the generation of a gas specially suited for furnace work. It is our present intention to demonstrate, by appeal to the results of further experiments, how, with still lower steam saturation temperatures, a most effective combination of rapid rate of gasification with high thermal efficiency can be continuously maintained over long periods of time, under ordinary works' conditions, furnishing a rich gas of high carbonic oxide content and eminently adapted for either power or heating purposes.

The previous trials [May to June, 1906] were carried out with two producers working with a mixed steam and air blast, preheated to a temperature of (about) 250° C. by passing through a system of superheaters, and delivering washed gas to both furnaces and gas-engines. Some three months later [September, 1906], when one of the two producers was shut down for structural alterations, the remaining one (whose rated capacity was 16 cwt. per hour) was successfully worked over a continuous period of three weeks, with a day-load of 24 cwt. per hour and a night-load of 12 cwt. per hour, with an effective fuel-bed 3 ft. 6 in. deep and a steam saturation temperature of 60° C. The fact that these large demands were met with perfect ease and regularity not only disproved in advance the prophecy of certain of our critics that so low a steam saturation temperature would be found to be incompatible with continuous working at three-quarters load day and night, but also led us to still further reduce the consumption of steam, with such excellent results as are recorded in the present paper.

Past experience had shown the desirability of making certain structural alterations in the producer in order to adapt it to the new working conditions. These alterations were carried out soon after the conclusion of the previous trials. It was also decided to reduce the effective height of the bed of incandescent fuel from 7 feet (as in the previous trials) to 3 ft. 6 in. above the top of the fire-bars. This thickness of fuel, it has been found, not only permits of very high rates of gasification, and keeps clinkering difficulties within easily manageable proportions, but is also sufficient to accomplish the decomposition of nearly the whole of the steam introduced in the blast—*i.e.*, with a saturation temperature not exceeding 60° C.—and to reduce the amount of carbon dioxide in the gas to 5 per cent., or even less.

The arrangements for cooling and washing the gas were slightly different from those previously employed. On leaving the producer the hot gas passed (1) through the three superheaters, (2) thence through the two rectangular iron washers, now arranged in series, in which it met with a fine spray of water thrown up by revolving dashers, whereby its temperature was reduced to about 50° C., and (3) up a gas-cooling tower, without water spray. The engine and furnace supplies were then differentiated. The engine supply was forced through sawdust scrubbers, in order to remove the last traces of tar; but the furnace supply was not so treated. The average temperature of the gas delivered to the engines was 16° C., while that of the furnace supply did not exceed 20° C.

Load on the Producer.

It being the principal object of these further experiments to demonstrate the practicability of high rates of gasification with low steam saturation temperatures and a gas rich in carbonic oxide, the load on the producer was purposely more than doubled as compared with the previous trials. The actual demands for gas on the part of the engines and furnaces were greater than before; and instead of there being two producers to meet them, only one was employed. The rated capacity of this producer (internal diameter = 10 feet) was 16 cwt. per hour. But throughout the new trials the rate of gasification averaged about 23·6 cwt. of coal per hour for the (twelve hours) day-shifts; and during the corresponding (twelve hours) night-shifts it rarely if ever fell below 14 cwt. per hour.† Therefore, during the daytime, the producer was successfully meeting a 47 per cent. "overload" demand, while during the night-shifts it was never worked below about 85 per cent. of its full rated capacity.

As a rule the two re-heating furnaces and the 650-H.P. "Premier" gas-engine were working during the day-shifts only. Occasionally, however, they worked during one night-shift in the week. The two puddling furnaces and 250-H.P. engine worked day and night continuously without interruption.

General Arrangements.

As in the previous trials, suitable arrangements were made for (1) weighing the whole of the coal charged into the producer throughout each trial; (2) the continuous sampling of the gas over a period of eight hours during each day and night shift (except the first night-shift in each trial), each sample therefore representing the mean composition of the gas generated during the particular shift concerned; (3) the collection and weighing of all the tar deposited throughout the plant during each trial; (4) the weighing of the ashes and coke withdrawn from the water-trough at the bottom of the producer; and (5) the estimation of the amounts of soot and fine ash carried over by the gas and deposited in the mains.

The samples of coal, tar, ashes, soot, gas, &c., were afterwards analyzed. Two sets of gas analyses were usually carried out—the one set, at the works, over mercury in the apparatus designed by the authors for commercial gas analysis.* This included all the samples taken. The other set, which usually included three selected "day-shift" samples, was carried out in the special research apparatus erected in the Fuel and Metallurgical Laboratories of the University of Leeds. The calorific value of the coal was determined in a slightly modified form of the Berthelot-Mahler bomb calorimeter.

From the analytical data were calculated: (1) The total carbon charged into the producer during the trial; (2) the proportion of this carbon lost in the tar, ashes, and soot; (3) the proportion of the carbon actually gasified; (4) the yield of dry gas, at 0° C. and 760 mm., per ton of dry coal; (5) the calorific value of the dry gas, per cubic foot at 0° C. and 760 mm., using as basis the numbers obtained for the several combustible constituents by Julius Thomsen, of Copenhagen, in his classical researches upon the heats of combustion of gases at constant pressure.

The "efficiency ratios" deduced from the results of the various trials are based upon the net calorific values of the coal and of the cold gas in each case; and they include an allowance for the coal equivalent of the steam required to drive the blower engine—viz., 0·65 cwt. per hour—assuming a boiler efficiency of 70 per cent. Since the whole of the steam added to the blast throughout the trials was exhaust steam, no allowance has been made for it. Neither has any allowance been made for the work expended in washing the gas. On the other hand, the producer has not been credited with the sensible heat of the hot gas as it left the superheaters, and which was dissipated during the process of washing it.

Analysis and Calorific Value of Coal used during Trials.

The coal used was the same as in the previous trials—namely, "Collins' Green washed nuts" from the Florida seam of the Collins' Green and Bold Collieries, near Earlestown, Lancashire. It was screened over a 1-inch mesh; and as charged into the producer it contained about 7 per cent. of moisture. The following are the results of the analyses of four different composite samples of the coal (dried at 105° C.), each one taken over a full week during the period covered by the trials.

—	1.	2.	3.	4.	Mean.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Carbon . . .	77·50	77·40	78·6	76·95	77·60
Hydrogen . . .	5·25	5·25	5·6	5·30	5·35
Ash	4·70	5·55	4·0	4·20	4·60

The sulphur averaged as nearly as possible 1·25 per cent.

The mean calorific value of the dry coal was—

Gross value = 3510 kilogramme Centigrade units = 13,930 B.Th.U. per lb.
Net value = 3380 ,, ,, = 13,410 ,, ,,

With regard to the ash of the coal, though low in actual quantity it was fairly fusible. It was, indeed, the second in order of fusibility of the ashes of the five Lancashire bituminous coals referred to in the previous paper.

Percentage Composition of the Gas.—As already explained, composite samples of the gas, each taken over a continuous period of eight hours during each day and night shift, respectively, throughout the trial, were analyzed at the works laboratory; and the close agreement between the mean composition of the day and night shift samples, respectively, at once proved that the quality of the gas was in no way affected by the great difference in the relative rates of gasification. In other words, the producer yielded as good gas with a load equivalent to 24 cwt. of coal per hour as it did with one of only 14 cwt. per hour. The same thing, moreover, applies to all the other trials; so that it may be taken as demonstrated that, under the working conditions adopted, the producer is capable of yielding a gas of remarkably good and uniform composition between wide limits as regards rates of gasification.

Remarks.—Comparing the results of this trial with those obtained in the corresponding trial of the previous series (*i.e.*, with the same steam saturation temperature, but with a much deeper fuel-bed—viz., 7 ft. instead of 3 ft. 6 in.), it is evident that with the shallower bed of fuel somewhat less steam has been decomposed (viz., 76 per cent., as against 87·4 per cent. of that imparted to the blast); and in consequence the gas contains less hydrogen—15·5

* See "Journal" for May 21, 1907, p. 524.

† These are the weights of coal "as charged;" for the dry coal they would be 22 cwt. and 13 cwt. per hour respectively.

* See "Journal" for Jan. 21 last, p. 160.

per cent. instead of 16·6 per cent. The thermal efficiency, therefore, works out somewhat lower; but probably the difference is not actually so great as the two efficiency ratios (0·725 as against 0·778) indicate, owing to the fact that in corresponding trials of the previous series the proportion of the total carbon gasified was greater than the general average of all the trials—namely, 94·2 per cent., as against a general average of 92·6 per cent. If allowance is made for this adventitious circumstance, the two efficiency ratios would be 0·725 and 0·762 respectively. The slight fall in efficiency with the thinner fuel-bed thus indicated is, in our opinion, quite outweighed by the much higher rate of gasification and improved working conditions generally. The lowering of the steam saturation temperature from 60° C. to 55° C. reduced the carbon dioxide in the gas by 0·7 and increased the carbon monoxide by 0·8 per cent. without appreciably affecting the hydrogen content. The whole of the steam corresponding to the saturation temperature of the blast (55° C.) was decomposed in the producer. Doubtless the blast entering at the fire-bars contained rather more steam than this; since, after saturation at 55° C. and passing through the superheaters, it would pick up a little more from the water-seal at the bottom of the producer. The thermal efficiency of the trial would probably have been somewhat higher than is indicated by the above figure had it not been for the breaking off of a fire-bar during the second day.

General Summary of Results and Conclusions.

The principal results of the trials may be summarized in one table as follows:—

Table I.

Steam Saturation Temperature of Blast.		60°.	55°.	50°.	45°.
Average coal consumption at the producer (day and night) in cwt. *dry* coal per hour		17·5	18·6	17·5	18·4
Average day-shift consumption, cwt. *dry* coal per hour		22·0	22·0	21·0	23·0
Average night-shift consumption, cwt. *dry* coal per hour		13·0	13·0	13·0	12·5
Average coal consumption for blower engine, cwt. per hour		0·65	0·65	0·65	0·65
Total carbon losses per cent. (in tar, ashes, and soot)		8·0	9·15	7·9	7·3
Percentage composition of the gas.	Carbon dioxide	5·10	4·40	2·50	2·35
	Carbon monoxide	27·30	28·10	30·60	31·60
	Hydrogen	15·50	15·45	12·35	11·60
	Methane	3·05	3·00	3·00	3·05
	Nitrogen, &c.	49·05	49·05	51·55	51·40
	Total combustibles	45·85	46·60	45·95	46·20
Calorific value of gas in B.Th.U. per cubic feet at 0° C. and 760 millimetres.	*Gross*	178·7	180·8	178·5	180·0
	Net	166·9	169·1	168·7	170·5
Yield of *dry* gas, cubic feet, at 0° C. and 760 millimetres per ton of *dry* coal		135,000	132,700	132,500	133,700
Lbs. of steam in blast per lb. of coal gasified		0·454	0·325	0·21	0·2
Percentage of steam decomposed		76	100	95	all
Cubic feet of air at 0° C. and 760 millimetres) per lb. dry coal gasified		37·45	36·75	38·6	38·8
Ratio of $\frac{\text{oxygen from steam}}{\text{oxygen from air}}$		0·44	0·42	0·3	0·33
Efficiency ratio, including steam for blower engine		0·725	0·722	0·718	0·73

General Conclusions.

(1) *Rates of Gasification and Quality of Gas.*—It may be fairly claimed that the trials demonstrate the practicability of high rates of gasification with steam saturation temperatures between 50° C. and 60° C.—thus disproving the confident assertion of certain critics that a higher saturation temperature than 60° C. is necessary whenever steady and continuous working at three-quarters load is required. There can be no gainsaying the fact that this producer, of 16 cwt. rated capacity per hour, has gasified coal over continuous periods of 112 to 136 hours, week after week for months together, at a mean rate of 18 cwt. of dry coal (= 19·3 cwt. "as charged") per hour, with an average day rate of 22 cwt. of dry coal (= 23·65 cwt. "as charged") per hour, without any difficulty whatever, and generating a gas containing 46 per cent. of total combustibles with a net calorific value of from 167 to 170 B.Th.U. and a gross value of 178 to 180 B.Th.U. per cubic foot, measured at 0° C. and 760 mm. Moreover, the results show that a variation in the load from 13 to 22 cwt. per hour in no way affected the quality of the gas—a very important consideration when variable loads have to be dealt with. The obvious advantages of a form of producer capable of not only rapidly gasifying the fuel but also giving an equally good quality of gas at both high and low rates of gasification, need no further comment.

(2) *Composition of Gas.*—The results are still more satisfactory when the composition of the gas is taken into account. The lowering of the steam saturation temperature from 60° C. to 50° C. reduced the carbon dioxide from 5·1 to 2·5 per cent., the hydrogen from 15·5 to 12·35 per cent., and increased the carbon monoxide from 27·3 to 30·6 per cent.—a figure which must be considered as very high for a producer gas. There can, we think, be no question about the suitability for furnace purposes of the gas obtained with a saturation temperature of 50° C. Our further experiences have only strengthened our conviction regarding the relatively greater "furnace efficiency" of carbon monoxide as compared with hydrogen; and we must still adhere to our former opinion as to the desirability of a high percentage of carbon monoxide in a gas destined for use in either steel-melting or reheating furnaces. For power purposes, the question of the carbon monoxide content is probably not so important, although we believe that a large number of gas engineers prefer a gas rich in carbon monoxide to one rich in hydrogen. It would, therefore, appear that there is no disadvantage about a gas rich in carbon monoxide for power purposes, but rather the reverse. The question of the relative efficiencies of carbon monoxide and hydrogen as gas-engine fuels must, however, be regarded as still *sub judice*, and outside the scope of our present inquiry.

(3) *Decomposition of Steam in Blast.*—Attention may be drawn to the fact that with saturation temperatures of 50° C. and 55° C. the whole of the steam added to the blast before it had passed through the superheaters was decomposed in passing through the incandescent fuel in the producer, and that as much as 75 per cent. of it was decomposed even when the saturation temperature rose to 60° C. Doubtless the amounts of steam actually entering at the bars slightly exceeded those corresponding to the respective saturation temperatures owing to the fact that the blast after leaving the superheaters passed through the water-sealed chamber below the bars. We have reason to believe, however, that the partial pressure of this extra steam did not in any case exceed 25 mm. It need hardly be pointed out that the decomposition of the whole, or as large a proportion as possible, of the steam actually entering the producer is a factor of considerable importance where hot gas is being supplied direct from the producer to furnaces.

(4) *Carbon Losses and Tar Production.*—Excluding the trial at 55° C., where the breaking off of a fire-bar during the second day caused a slight increase in the carbon lost as coke, it would appear that on the average 92·2 per cent. of the carbon in the coal was converted into permanent gas, 6·5 per cent. appeared as tar, and the remaining 1·2 per cent. was lost as coke, soot, &c. In the series of trials recorded in our previous paper, 92·6 per cent. of the carbon charged into the producer was gasified, 6·1 per cent. appeared in the tar, and 1·3 per cent. was lost as coke, soot, &c. It would appear, therefore, that the employment of a shallower bed of incandescent fuel, together with lower steam saturation temperatures, in no way affected carbon losses.

(5) *Efficiency Ratios.*—The "efficiency ratios," based on the net calorific values of the coal and cold gas respectively, and including the steam required to work the blower engine, were practically the same—namely, about 0·72—in all the four trials. Therefore the selection of a steam saturation temperature between 50° C. and 60° C. will depend on other factors than mere thermal efficiency. It is also obvious that the saturation temperature cannot be advantageously reduced below 50° C.

If no account be taken of the steam required for the blower engine, the ratios of the net calorific value of the cold gas to that of the dry coal would be about 0·75; while if the comparison be based on the gross calorific values respectively, the ratios would fall between 0·76 and 0·77. As the latter ratios are frequently, though erroneously, quoted as "efficiency ratios" in statements of the results of producer trials, it is desirable to draw attention to them, in case these trials are compared with others. None of the above ratios, of course, credit the producer with the sensible heat of the hot gas leaving the superheaters.

Reorganization of the St. Petersburg Gas Supply.

It will be remembered that a short time ago the City Council of St. Petersburg invited firms to submit projects and tenders for the reorganization of the whole gas supply of St. Petersburg. According to a report in the last number of the "Zeitschrift für Beleuchtungswesen," the Council are about to come to a decision as to the future of the gas-works. Three projects are still under consideration; but our contemporary reports that, of them, a scheme submitted by the German Continental Gas Company, of Dessau, has (according to rumour) a very good prospect of being adopted. The Company have undertaken in their tender to at once extend the distributing system to 135 verst (89½ miles), and to carry out a number of improvements within a period of four years. On the other hand, towards the close of last month some reference was made in "The Times" to efforts now being put forth by London capitalists to secure the concession for the gas supply of St. Petersburg, respecting which an advertisement inviting tenders appeared in our columns some weeks ago. According to the correspondent of our contemporary in that city, the Committee of the Municipal Council entrusted with the consideration of the tenders have unanimously accepted the proposals submitted on behalf of Coalite Limited; and sanction by the Municipality is believed to be assured. It is stated that this will be the first practical participation of English capital in municipal enterprises in St. Petersburg.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The Fifth Annual Meeting of the Scottish Junior Gas Association—Eastern District—was held in the Heriot-Watt College, Edinburgh, on Saturday afternoon last. There was a good attendance.

The PRESIDENT (Mr. D. Bisset, of Granton) expressed his pleasure at seeing such a fair gathering of the members. He hoped the attendances would keep up, because there was nothing which made meetings go with more energy than to have good musters. He thought that at this stage of the meeting it was seemly that something should be said about the great loss which the gas world had sustained by the death of Sir George Livesey. One of the great men belonging to their industry had passed away, and had that afternoon been laid to his rest. As an Association, it had never been their good fortune to come in contact with Sir George Livesey; but they knew that his sympathies were with the Juniors. They could not allow such a man to pass away without taking notice of the event; and he therefore moved that, as an Association, they express their regret at the death of Sir George Livesey, and that they offer their profound sympathy to Lady Livesey and the other relatives in the great loss they had sustained. He had received intimation from Mr. W. R. Herring that he could not be with them that day, as he had intended, as he had gone to London to attend the funeral. The Secretary also had a communication from Mr. Alex. Wilson, of Glasgow, regretting his inability to be present, as he also had gone to London.

The motion was agreed to.

The PRESIDENT intimated that three new members had joined the Association. He was very glad to welcome these gentlemen, and hoped they would get great benefit from their membership, and that, at the same time, it would do great good to the Association. The time had now come for him to vacate the position of President. During the two years he had been in office—as Vice-President and President—he had been able to attend every meeting and every visit of the Association. His tenure of office had doubled his belief in the many benefits to be derived from active membership of an organization such as theirs. The day was past when such a point required labouring. The Eastern District were now entering upon their fifth session of work, and were looking forward with confidence to even greater success than they had achieved before. If every member on the roll would realize his personal responsibility to the Association, success would be assured. They had to recognize the assistance they had all along received from their honorary members, and from the owners and managers of works which they had had the privilege of visiting. He could not quit the chair without expressing his personal thanks to the Vice-President and members of the Council; and his thanks were also due to the Honorary Secretary, who had never spared himself in the work of the Association. His last duty was a very pleasant one. It was to introduce to them—if introduction were necessary—their new President, Mr. A. Morton Fyffe, Assistant-Engineer at the Dundee Corporation Gas-Works. He was persuaded that under Mr. Fyffe's guidance the current session would be one of the most successful they had had.

Mr. FYFFE, having taken the chair, proposed a hearty vote of thanks to Mr. Bisset for the manner in which he had discharged the duties of his office during the year. He had much pleasure in handing Mr. Bisset, in their name, the badge of the Association in recognition of his services, and was sure the good wishes of the Association went along with it.

Mr. BISSET briefly returned his thanks.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said they were very sorry that Mr. John R. Moyes could not continue in office as Secretary. Much as they regretted it, they must accept the situation, not, however, without conveying to Mr. Moyes their appreciation of the work he had done for them. He asked the members to accord to Mr. Moyes a hearty vote of thanks.

Mr. MOYES having acknowledged the vote, the following were elected to office:—

President (ex-officio).—Mr. A. Morton Fyffe, of Dundee.
Vice-President.—Mr. H. Rule, of Falkirk.
Hon. Sec. and Treasurer.—Mr. J. Dickson, of Kelty.
Members of Council.—Messrs. H. Gourlay, of East Wemyss; R. B. Waddell, of Dunfermline; W. Geddes, of Edinburgh; and W. Dunlop, of Kirkcaldy.
Auditors.—Messrs. J. Davie and J. G. Farquhar, of Edinburgh.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his address. After a few complimentary observations, he said: In considering on what topics to frame the Presidential Address, I met with some difficulty, because so many past addresses have so adequately covered the ground usually allotted to such an occasion. However, I came to the conclusion that it might prove of interest if I were to occupy a short time to-day in dealing with some of the recent apparatus introduced into the manufacture and distribution of gas, and then consider the various methods which have been employed to enlarge the applications of our product, and bring before the public the benefits accruing from its use. Dealing with recent devices and apparatus, it is quite within the mark to assert that many of the ablest engineers of to-day are contributing to our branch of work by their inventions. Everything that skill and ingenuity can do is being done to minimize the risk of any failure in the supply, to make regularity and uniformity as impregnable as possible; and the recent advances in this direction have gone far to reduce the anxiety of engineers in charge and strengthen the confidence of the public in gas as a thing for every-day use.

This ideal has been brought nearer to realization by the introduction of that piece of apparatus known as the retort-house governor. This cannot perhaps be claimed as a new piece of apparatus. I am informed it was first constructed at London about twenty years ago, and used at some of the works there. But for a considerable time its advantages seem to have been overlooked in the Provinces; and it is only recently that it has been installed as a universal piece of apparatus and regarded as invaluable. So we are at liberty to place it on the list of recent introductions so far as we are concerned. These governors have many advantages, among the chief of which are the following: The shallow seal which may with perfect safety be used in the hydraulic main; the increased volume and the higher illuminating power thus obtained; the minimum of risk of drawing air into the foul mains, and the prevention of leakage at mouthpiece lids; the maintenance of a steady vacuum between the retort-house governors and the hydraulic main; and the lessened deposit of carbon inside the retorts, which was formerly so troublesome and so expensive. These are but a few of the many advantages of retort-house governors, which, in my opinion, ought to be installed in every retort-house, and at a point as near to the hydraulic main as is possible. They should be fitted at a higher level than the hydraulic main, in order that an excess of tar may not find its way into the governor; and, of course, an adequate bye-pass must be provided, so that the governor can be cleaned out at any time without suspending operations.

In installing any new piece of mechanism which does not command the experience that time alone can give, small technical difficulties ofttimes present themselves; and before leaving this subject, I may point out the difficulty we experienced in Dundee by the corrosion of the bell, more especially at the water line. This was overcome by using a film of oil about 3 inches deep. The maintenance of the water line was obtained by dipping the inlet water-pipe below the oil-level; the overflow pipe being raised on the outside of the tank to the level of the oil inside the tank. Since this was done, we have experienced no difficulty by corrosion.

Improvements have also been made on the apparatus used for automatically controlling the speed of the exhauster by the regulation of the steam supply. These automatic steam controllers had hitherto the great disadvantage of being so constructed that the amount of friction to be overcome in the inertial movement sometimes prevented the apparatus being sensitive enough to comply with small variations. The improvements on this very ingenious piece of apparatus, however, have reduced the friction to almost the minimum, and have thus given the degree of sensitiveness which was so much desired. The most modern type of the automatic steam controller, in conjunction with the retort-house governor, makes it possible to have a vacuum at the exhauster inlet which gives practically a straight line on the recorder at this point, and limits the variation to within 1-10th of an inch, which is surely an achievement in mechanics. The gauge at the governor in the retort-house is exactly level at zero, while the vacuum to be maintained at the exhauster inlet depends on the distance from the retort-house, and the number of bends on the intervening main, as well as other purely local conditions. The retort-house governor and the improved automatic steam controller on the exhauster are a combination well worthy of our very careful study.

Another subject which has lately received much attention from gas engineers is the elimination of tar fog and naphthalene from the gas. One of the sources of annoyance has long been the chokage of street-mains and service-pipes by this dreaded white crystalline substance known as naphthalene; but obstacles only prompt the real engineering spirit to overcome them, and so we now have many devices for dealing with the trouble. One method is to wash the gas by passing it through a Livesey washer filled with various solutions or oils. This has met with success in some measure; but probably the most recent method is better still—namely, the extraction of the tar fog and naphthalene at a high temperature when they are still in a thin, oily condition. Various extractors for this purpose have been placed on the market. Opinions differ as to the proper position for such a plant; but probably a point immediately before the gas enters the condensers is the most suitable. To be effective, a uniform temperature must be maintained on the apparatus; and it is necessary to closely observe the inlet and outlet temperatures and vacuum. The pressure absorbed should not exceed one inch, and a small supply of live steam for the maintenance of the right temperature is most necessary. The results obtained at different places vary slightly; but it is within the mark to say that on the average about 50 per cent. of the naphthalene is extracted. Indeed cases have been cited where the gas at the inlet to the extractor contained 45 grains per 100 cubic feet, and at the outlet as little as 18·5 grains per 100 cubic feet; and this result was obtained without any sacrifice of volume or quality of the gas treated. If results such as these can be obtained, the introduction of the relative plant ought to be considered, as the capital

charges will be more than met by the saving in clearance of mains and services.

Another sign of progress is to be seen in improved chemical plants for the treatment of bye-products. I am told that a new form of sulphate of ammonia plant is to be placed on the market shortly, which will do away with the existing washers. The idea is that the gas should be passed through the new plant before being purified, and the ammonia extracted and sulphate manufactured there and then, and the gas passed on *minus* ammonia, but otherwise similar to its present condition on entering the purifiers. If the plant is capable of all the inventors hope for it, there will be no hesitation on the part of gas engineers to adopt it.

Then there is the very interesting question of vertical retorts, from which so much is hoped for by those who are in a position to judge; but it is too soon to treat them as a common method of carbonizing coal. Nevertheless, I think we ought to follow their evolution with the utmost care, as the subject has been taken up by engineers whose eminence justifies us in assuming that the study is worth while.

So much, however, for the improvements in manufacture. But if these improved methods of manufacture are to find scope, the uses of gas must be enlarged; and its advantages as a power or light must be brought prominently before the public. That there is room for great expansion is being clearly demonstrated every day, and that notwithstanding—indeed, in some degree as a consequence of—the opposition of electricity. The commercial side of the industry is being fostered more than ever; and this must continue to be so, if our rate of progress to-day is to be continued to-morrow. The popularity of gas as the best and most hygienic means of cooking is a source of success to the industry. The cost is so ridiculously cheap, that even when coal is at its cheapest point gas cooking is cheaper still; and the advantages all round are so great that if this part of the business is merely carefully looked after nothing need be feared. As a means of heating, its economy is becoming well recognized—no dust, no smoke, no smell, no large boilers, and no large fuel bills warrant us in feeling safe as to our expansion here. Gas lighting, in spite of all opposition, has nothing to fear; and its use for this purpose is more extensive every day. For this our thanks are due to the inventors of the modern burners, both for private and public lighting. The inverted incandescent burner has been a great boon, and has superseded any other means of lighting, and no less for street lighting than for house use. It is an admitted fact that street lighting can now be more efficiently undertaken by gas than by electric light, and at a cost equal to one-third that of electric light; and the introduction of gas lighting into our main thoroughfares is a sufficient answer to our opponents. It is altogether useless to go into figures as to relative illuminating power; for, after careful study, I have been forced to the conclusion that the candle power of electric lamps must be calculated in some different method from the usual one, or the standard candle must in some inexplicable way have diminished. At the same time, we must not rest in any sense of false security; we must be as active as ever. Disaster has often come to those who were foolish enough to under-rate the ability of their opponents.

The modern craze for advertising has found its way into the gas industry, and the reason is to be found in the fact that no concern can be successful now without the help of advertising. It matters not whether the article is an essential, it must be advertised well and cleverly; and if gas departments are advertising more than before, no excuse need be offered. It is necessary, however, that we give our attention to the adaptation of gas for power work. Medium-sized gas-engines are doubtless very economical, and as such are being used. But the small loads are being lost because electricity has done well in its appliances for this class of work; and we must do better if we are to keep alongside—we must not assume that the existing state of matters is always to hold good. This is another of the many points requiring attention and the best of our intellect.

The question of large loads is also a serious one; suction-gas plants are forging ahead for work such as the total power for engineering shops and factories; and we are much handicapped by the fact that the gas supply at present must be one of good candle power, which is wasted on engine work. Although it is perhaps contrary to experience, I have often thought of the feasibility of laying a second set of street mains for the supply of low-grade gas for power purposes; and if this could be done at a reasonable price, a great field would be opened up for gas, because the workshop or factory proprietor would gladly part with the trouble of generating power for himself. But this question of power supply seems to me to be a strong argument for the general reduction of candle power, which would entail no hardship in these days of the universal use of the incandescent burner, the efficiency of which suffers in many places by reason of the high illuminating power of the gas supplied. But this is one of the points on which we have yet to educate our consumers, and to get them to see that the interests of the gas department coincide with their own.

I am aware that many engineers are engaged on the perfecting of the gas-turbine; and this machine, once perfected, will be of great use in extending the application of gas for power. It is, however, difficult to estimate what progress is being made with the evolution of the turbine. I think that more is being done in Germany to this research than in our own country. But those engaged in the work are naturally very reticent on the matter, so that we cannot really say much about it at this time. Improvement might be made in the consumption of gas for power if the sliding-scale of charges were more widely introduced. In my opinion, this system of charging is certainly the most equitable to all concerned.

Part of the cost of gas is concerned with capital charges; and is it fair to charge a similar rate per 1000 feet to the consumer who is constantly using gas for power to that charged to those who require a supply for light—say, where it is only needed for an hour or two on a winter afternoon, as in the case of workshops or factories? The latter load is not a desirable one for the gas department; but if it must be met, then the capital charges incurred in providing plant for this occasional and unremunerative consumption ought in all fairness to be paid by the party benefiting. On these grounds, I beg leave to bring the question of sliding-scale charges under your notice.

Having dealt with some of the new introductions, the proper thing to do is to look forward to even better things, and to work to bring these into concrete realities. Here I think lies the chief sphere of our Association. Having seen how much has been done, let us realize how much is yet to do. This is an age of progress; and although it is true that gas engineering has stepped into line with this progress, we must take very good care that in our hands the progress will be maintained. If this is to be so, it is absolutely necessary that we have an objective. No Association, no industry, no undertaking, no individual need ever hope for success unless a definite objective is clearly set up. The chief object of our Association, as stated in the syllabus, is "To extend the knowledge of its members;" and no better object could have been put before us. But in this extension of knowledge, many faculties must be employed; and some of them have first to be cultivated ere they can be utilized to the utmost advantage. It is a difficult task to specialize any faculties as being the essentials; but I have chosen three, which it seems to me at least are to be reckoned as among the first or the most important. These are, comprehension, enterprise, resource; and I will deal with these in a brief way. The faculty of comprehension is one which is invaluable to any engineer; and it may be classed as one of those requiring cultivation. It is the lack of cultivation of this faculty which causes us to hear so often the phrase, "I didn't notice that before;" and it is well to remember that it is from ourselves that this expression has so often had to come when some keener spirit than ours has pointed out some slight mistake or omission in our work, whether it be design or administration. We need not be ashamed when one abler than we are points out possible improvements that are the outcome of a wider experience. To say that we should never be in a position to have our schemes and ideas bettered is tantamount to the assertion that we know equally as much as anyone else, which would be at once both pedantic and absurd.

Then we ought to cultivate the ability to comprehend the methods and appliances in use in the works which we visit. I have heard it stated by men of experience that it ought to be possible for a trained engineer, after having walked through a large workshop or factory, to be able to tell the motions of the various pieces of mechanism at work and the process of production. Of course, that would be the case if comprehension were very highly cultivated; but, nevertheless, it ought to be our habit to use our eyes to the best possible advantage. There is also the comprehension of what is required when we commence to design or form a system of administration—the ability to see all sides of the question, all the possibilities of flaws, all the likely weaknesses, the necessary details, and essential minor parts, so that our schemes may indeed be comprehensive and as near perfection as possible. In order to attain this, it must be possible to see in our mind's eye the completed work, and, more important still, to see it in operation—in other words, it is useless to plan anything without bringing imagination into play; and it is that same imagination which makes the successful inventor. After all, is it not the case that every efficient engineer is an inventor more or less? The faculty of enterprise next commands our attention. If any profession calls for enterprise it is engineering; and at no time more than the present was enterprise an adjunct of success. This spirit of enterprise—in other words, of bold adventure—relieves the monotony of work and helps to make a man a useful member of any industry or profession. It is the courage to launch out on new methods and new designs that makes the invaluable engineer; but this courage must be tempered with common-sense if it is to succeed. Old stereotyped methods must be cast aside; but not before they have been examined and the useful parts, if any, retained to assist in the new order of things. Mistakes are sometimes made by altogether ignoring the old ways of working; and it is well to remember that in some degree these old methods are the outcome of years of experience, and we cannot afford to dispense with the experience of the past. We can claim that enterprise has given us better light and greater power, and we must embrace it in our curriculum.

Another essential to success is resource—that quality which devises means of dealing with difficult situations, and, moreover, with the difficulties that may arise in a gas-works so suddenly, and which must be dealt with immediately if our reputation is not to suffer. In dealing with the supply of any commodity, such as water or gas, which is used and regarded as a necessity by every one, it is imperative that the supply be entirely free from interruptions of any kind. But we have to face the fact that, despite all we can do, accidents will happen—and happen, too, at the most awkward times; and unless the man at the head of

affairs has cultivated the faculty of resource, disaster is unavoidable. If the difficulty is to be met and overcome successfully, the engineer's brain must be capable of working rapidly and, at the same time, originally. It is not of much service to seek to remember how the situation was dealt with by other men at other times and under different circumstances. The one question is: How is it to be overcome now? It is also too late to think of cultivating resource when the difficulty makes its appearance—it ought to be ready for practical application by then.

In closing, I would ask for the enthusiastic support of every member, so that this session may find our Association of much help in enlarging the scope of our work and in widening the sphere of our knowledge.

Mr. H. RULE proposed a vote of thanks to the President for his admirable address. He had gone on entirely different lines from that of previous Presidents; and he was sure their knowledge would be all the more increased thereby. With regard to his ideas in the latter part of his address, he (Mr. Rule) cordially commended them for future consideration.

CONCLUDING BUSINESS.

Mr. H. GOURLAY (East Wemyss) moved—"That the annual general meeting and election of office-bearers be held at the end of the session, instead of at the beginning."

Mr. BISSET seconded the motion, which was supported by Mr. Moyes, and unanimously agreed to.

It was intimated that the work of the session had been arranged as follows: Oct. 31, visit to the Stirling Gas Company's works; Nov. 14, quarterly meeting; Dec. 12, visit to the Straiton Lime-Works; Jan. 16, 1909, quarterly meeting; Feb. 13, visit to Messrs. Parkinson and W. & B. Cowan's Meter-Works, at Edinburgh; March 6, quarterly meeting; March 27, visit to the Carron Iron-Works, as to which negotiations are in progress for making the visit a joint one with the members of the Western District Section of the Association.

A discussion took place as to whether all the quarterly meetings should continue to be held in Edinburgh. The Council felt that it might be desirable that some of them should be held in other centres, for the convenience of members who were not able to travel to Edinburgh. The President moved that one meeting be held in Kirkcaldy and another in Dundee. Mr. W. Williamson (Leven) moved that the next quarterly meeting be held in Dundee, and that consideration of the holding of a meeting in Kirkcaldy be held over. Mr. Gourlay moved that the next meeting be held in Kirkcaldy; and, if it were successful, the following meeting might be held in Dundee. The motion of the President was adopted by a very large majority over both of the other motions; and it was resolved to meet in Kirkcaldy on the 14th prox., and in Dundee on the 6th of March.

The meeting was then brought to a close.

HIGH-PRESSURE GAS SUPPLY FROM THE MÜLHEIM GAS-WORKS.

A brief note in last week's "JOURNAL" recorded the inauguration of a high-pressure supply of gas from the Mülheim Gas-Works to certain suburbs. Fuller details were published in the "Journal für Gasbeleuchtung," of the 26th ult.; and some further points of interest may now be quoted from that source.

Up to the year 1903, the supply of gas to the district of Saarn took place partly from the gas-works at Mülheim-on-the-Ruhr, and partly from the neighbouring town of Broich, which stands on the opposite bank of the Ruhr to Mülheim. In 1903, however, the Broich Gas-Works were taken over by the Mülheim gas undertaking, and then ceased to be used as a manufacturing station. The supply to Saarn had hitherto been attended with considerable difficulty, on account of the relatively low position of the place; and from the fact that as the bulk of the supply was consumed in tanneries, the demand for gas was practically limited to a few hours. It had, therefore, appeared that a main of adequate size to meet this short demand would not be profitable. When the Mülheim Gas-Works took over the sole supply, certain mains were linked-up; and it was hoped that thereby the demand for gas in Saarn would be properly met. But it was soon found that this was not the case. One of the gasholders at Broich was then reserved for the supply of Saarn; the gas being pumped into it by an exhauster, and delivered at a pressure of 33-10ths. It was found, however, that unless a number of valves were shut as soon as this higher holder pressure was put on every evening, the bulk of the gas found its way back to Mülheim. It was then decided to lay a new main to Saarn, with a branch to an elevated district to the south, where there had been much extension of building. It was found that if the main were to form part of the ordinary distributing system, it would require to be of a diameter of some 18 inches for a distance of 2515 yards to the pumping station. Thence a main 16 inches in diameter, and 1090 yards long, would lead to the new district, and a 10-inch main, 1310 yards in length, to Saarn. On the other hand, it was calculated that a high pressure main of 8 inches diameter as far as the pumping station, and 6 inches diameter from there to Saarn, would suffice, with a low-pressure main, 12 inches in diameter, from the pumping station to the new district.

The initial cost of the high-pressure scheme would be £2250 less than the low-pressure one; while the maximum capacity per hour would be greater with the former. There was the further advantage that still more distant districts might later on be coupled up with the high-pressure main. The diameters of the high-pressure mains were chosen so that for a time the maximum pressure thrown by one of the gasholders—viz., 10·6 inches—would suffice to give the requisite supply, and so the compressor need only be brought into use in case of emergency.

The compressor that was provisionally installed is a three-blade exhauster of a capacity of 44,145 cubic feet per hour, coupled directly to a steam-engine, and provided with a safety return-valve. It is intended next year to add another exhauster. Valves were introduced which admitted of the supply being taken direct from the holder or from the compressor. A governor station was established under the roadway on the Mülheim-Saarn road. It has an area of 6 ft. 6 in. by 7 ft. 9 in., and a height of 8 ft. The walls are tiled, and the roof is of concrete. Ventilating flues from the floor and roof of the governor station are carried up existing columns in the boundary wall of a churchyard. The station contains an automatic "Bamag-Ledig" governor; and there is room for an additional governor which will be required when the pressure is increased. A special district governor, controlled by weights, has been installed on the main leading to the new district. The necessary change of pressure for the evening is made by the man in charge of the pumping-station.

The arrangements described incidentally allowed of the pressure being improved in the adjacent town of Styrum (to the north of Mülheim), which likewise at one time had its own gas-works—since taken over by the Mülheim Corporation. The new scheme (the work for which was carried out by the Berlin-Anhalt Engineering Company) is reported to have proved very satisfactory in operation.

Investigation of the Bunsen-Flame.

In a recent number of the "Chemiker Zeitung" Dr. F. Haber, of Carlsruhe, is reported to have delivered a lecture at a meeting of chemists of south-west Germany, in the course of which he described researches he had been carrying out, in co-operation with others, upon the bunsen flame fed with mixtures of oxygen with carbonic oxide, hydrogen, or acetylene. The carbonic acid and aqueous vapour formed were withdrawn from the flame by means of silver capillaries; and it was found that the highest flame temperatures did not occur with the theoretical mixtures, but when the hydrogen or carbonic oxide was in excess. The character of the radiation of the light of the inner cone of the bunsen flame has been shown to be of the nature of a chemical luminescence. Further investigations have led to the conclusion that in the green inner cone of the flame an electric dissociation occurs, whence result intermediate products of the chemical reaction which takes place in the flame. The investigations will be reported on more fully later.

Loans for Reinforced Concrete Works.

We are glad to learn, says the "Builder," that the Association of Municipal Engineers have addressed a further letter to the President of the Local Government Board, pointing out the inconsistency of the attitude hitherto maintained by the Department in respect of the period for the repayment of loans on reinforced concrete structures. It is really absurd that while the period of thirty years should be allowed in the case of concrete and steel not in combination, and where the steel requires for preservation a constant renewal of painting (which it may not always get at the proper intervals), only fifteen years should be given for concrete and steel in combination, where the metal is effectually preserved against corrosion and fire. So far as we have been able to gather from his own remarks, Mr. Burns relies absolutely upon the advice given by his technical staff, who, being more conservative than the architectural and engineering experts of the Admiralty, the War Office, and the Office of Works, cannot bring themselves to approve a new-fangled thing like reinforced concrete. There is not the smallest foundation for the doubts expressed by the Local Government officials; and we join heartily in the appeal now made, hoping that with the courage he has displayed in other directions Mr. Burns will decline to be governed by his unreasonably prejudiced subordinates, and will institute a thorough inquiry into the merits of reinforced concrete for structural work.

Mr. Balfour Browne, K.C., who has accepted an invitation to become the Conservative candidate in East Bradford, is now addressing a series of meetings in the division.

Baron Auer von Welsbach has for some time past been at work upon ytterbium—one of the rare earths; and by studying its spectra he has found it to be composed of three other substances. Two of these he has isolated, and named them aldebaranium (Ad.) and cassiopeium (Cp.); but the third has so far escaped perfect separation. The atomic weights are Ad. = 172·9 and Cp. = 174·23. They cannot be distinguished by chemical means, but by their spectra.

REGISTER OF PATENTS.

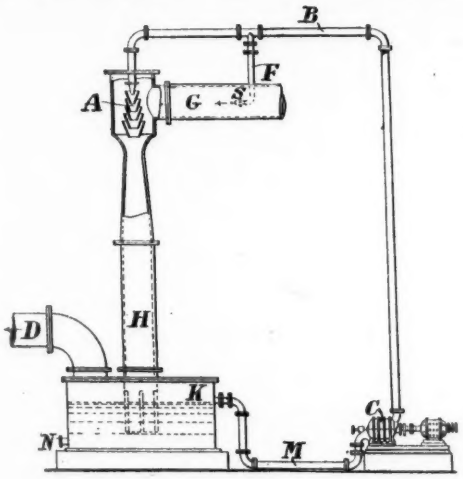
Removing Tar from the Hot Gases from Gas-Retorts or the Like.

OTTO-HILGENSTOCK COKE-OVEN COMPANY, LIMITED. A communication from Dr. C. Otto and Co., of Dahlhausen-on-the-Maine, Germany.

No. 12,809; June 15, 1908.

For the removal of tar from the hot gases of distillation from gas-retorts, coke-ovens, or the like, the patentees propose to cause the gases to pass through an injector fed with suitable gas tar, coke-oven tar, or the like, or with ammoniacal liquor containing tar, or with both. The injector fulfils the double function of freeing the gas from the tar and of circulating the gases.

The economical advantage of using this tar injector is said to reside in the fact that, the tar being removed from the gas thereby, without the removal of the ammonia, the gases can be passed directly to the ammonia absorption apparatus—an object which hitherto has been difficult of attainment, because of the tar contained in the gas.



Otto's Tar-Remover.

The injector being supplied under pressure with the tar or tar and liquor, the gas containing tar is thoroughly mixed with the injected matter, and the removal of tar is said to be very efficient. Thus in one instance, a cubic metre of coke-oven gas at 115° C. contained 45·01 grammes of tar before the injector, whereas after it the amount was only 2·48 grammes.

The high temperature of the gases makes the injector liable to be choked by particles of thick tar deposited from the hot gases; and to avoid this trouble a thin tar may be sprayed into the gas before the injector. The thin tar may be conveniently supplied from the pipe conveying tar to the injector.

A is the tar-injector, to which the tar is fed through a pipe B by the pump C. In the gas-main G which enters the casing of the injector is a spraying device S, connected with a branch F from the pipe B. By this arrangement, tar is sprayed on to the parts of the injector and the particles of thick tar washed therefrom as may be necessary. The tar injected through A, together with tar collected from the gas, passes down the pipe H into the catch-box K, and as much of it as is required flows back to the pump C through the pipe M. The pipe N serves to draw off the excess of tar. The gas passes away through the main D.

Coin-Freed Gas-Meters.

SIMPSON, S., of Exeter.

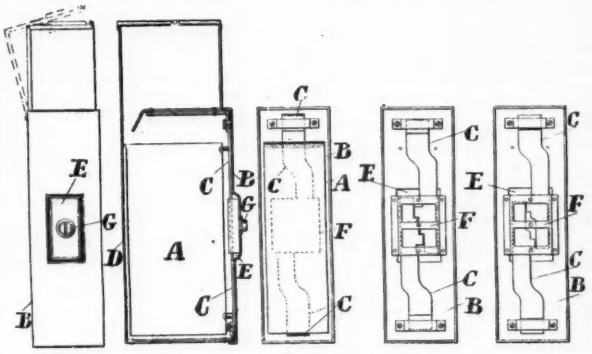
No. 22,485; Oct. 11, 1907.

This invention has for its object so to mount a cover plate for the coin receptacle for meters that its surreptitious removal shall be rendered impossible or difficult, and to provide a very secure fastening for the cover plate which renders unnecessary the employment of a separate lock.

The illustration shows (1) an elevation of the coin receptacle detached from the meter, with the hinged cover permitting the inspection and repair of the coin-freed mechanism; (2) a sectional elevation, with the detachable coin receptacle locked to the casing; (3) a back elevation, with the receptacle separate from the casing; (4) a back view of the cover plate with the coin receptacle removed and with the locking bars or bolts in their unlocked position; (5) a similar view with the bars or bolts in their locked position.

The coin receptacle has a detachable cover plate formed with a rim which encloses the side or front of the receptacle. On the inner face of the cover plate there are bolts that extend across the cover plate and engage with turned-down edges, flanges, or slots of the outer casing of the coin receptacle, or with catches provided for the purpose, so that when the cover plate is mounted in position it is securely held and locked "in the manner of the door of a safe."

The metal box D (or outer casing) is preferably formed from one piece of sheet steel, having an aperture at the side for the withdrawal of the coins. The edges at the top and bottom of the aperture have inturned flanges to engage with the bolts C that lock the cover plate B in position. The cover plate itself has a recess E on its inner face for the reception of the levers and springs of the lock F. This latter, it will be understood, forms (according to this invention) an integral part of the cover plate, and advantageously consists of two or more bolts or levers C, which extend in opposite directions to engage with the inturned flanges or with slots or their equivalent on opposite sides of the aperture in the casing. The bolts or levers are operated by keys inserted through holes G provided centrally in the cover plate.



Simpson's Prepayment Meter Box.

Attached to the cover plate is a metal-box A to receive the coins, or the inner or coin receptacle may be made separate from the cover plate B (if deemed advisable), and the cover plate may have a handle by which it can be opened and closed.

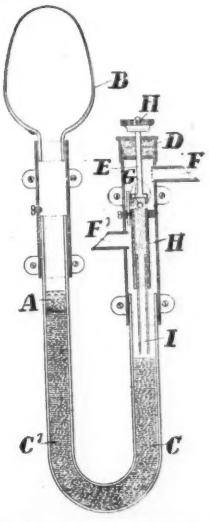
By making the recessed cover plate to surround the sides of the casing, the springing or bending open of the casing is prevented, and by mounting the lock upon the cover plate as described, a much stronger fastening of the cover plate to the casing is said to be secured than where separate padlocks or other locks are used.

Automatically Regulating Gas-Heating Apparatus.

HORNE, C. H., of Finsbury Park, N.

No. 23,016; Oct. 18, 1907.

This invention relates to a device for regulating gas-heating apparatus of the kind wherein a thermal fluid contained in a closed chamber or bulb above a quantity of a heavy liquid in one limb of an inverted U-shaped tube expands under an increase of temperature to displace the heavy liquid so as to cause it to close the mouth of an adjustable gas-supply pipe in the other limb of the tube. Such devices are used to maintain the supply of gas to a pilot-flame (by means of a small hole or slot made in the gas-supply pipe, which hole is never covered by the liquid); and the present invention consists in arranging the supply of gas to the pilot-flame to be maintained by a bye-pass contrivance arranged within the thermostatic device itself, and constructed so as to be capable of adjustment.



Horne's Regulator for Gas-Heating Apparatus.

The device (as shown) comprises a U-shaped tube, preferably formed in sections, one arm of which carries a bulb B filled with a thermal fluid maintained by some readily vaporized liquid A supported on top of a column of mercury or other heavy liquid C. The other arm of the tube is closed by a cap D and packing, through which passes a rod E carrying at its lower extremity a tube H screwing into a plug carried in the main tube, and having fitted therein a downwardly extending tube. The supply pipe F from the main enters above the plug as shown, and the supply pipe F1 to the heating apparatus leaves below it. The tube is provided with holes or perforations G capable of being closed by screwing the tube H downwards, by means of the rod E and milled head H, until the plug covers them; while a small tube is mounted in the plug and remains permanently open, connecting the parts of the tube above and below the plug.

In operation, the holes G are wide open and the gas supply turned full on until the atmosphere attains the desired temperature. Thereupon the tube H is lowered until the perforations are covered so as to sufficiently reduce the flow of gas which passes from the tube F to the tube F1. So long as the atmosphere remains at this temperature, the

heating apparatus will continue to burn the full supply of gas admitted by the apparatus; but in the event of the air becoming overheated, the thermal fluid in the bulb B expands and forces the liquid C up the opposite arm of the tube until it closes the tube I, whereupon the supply of gas is shut off, with the exception of the bye-pass burner, which is maintained alight by the quantity of gas which can pass to the burner. But as soon as the normal temperature of the atmosphere is again reached, the thermal fluid will have contracted sufficiently to re-open the tube I, whereupon the heating apparatus will again be supplied with the full amount of gas.

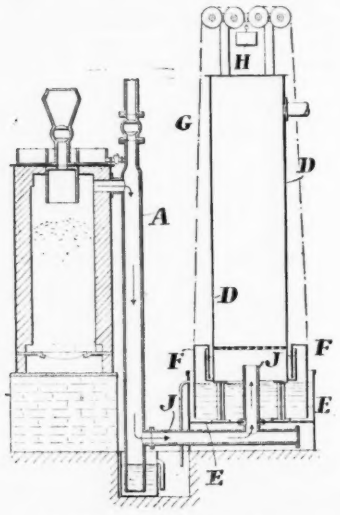
Power-Gas Producing Plant.

WHITFIELD, C., of Shortlands, S.E.

No. 23,679; Oct. 26, 1907.

This invention has for its objects, first, to provide for the better regulation of the amount of moisture in the air used for supporting combustion in the producer, and, secondly, to provide facilities between the producer and the gas-scrubber, and preferably in the lower part of the scrubber, whereby the flow of the gas from the producer into the scrubber is automatically regulated and the gas in the scrubber prevented exceeding a given maximum pressure, or be kept up to a normal or maximum pressure—the invention being suitable for use either with pressure or suction-gas plants. A further object is to control the flow of the gas by devices not liable to stick owing (say) to tar carried over by the gas.

The outlet pipe of the producer is enclosed by a closed-ended sleeve of thin sheet metal, and preferably of D section. At one end the sleeve opens into the ash-pit of the producer; and at its other end it communicates with the atmosphere by a pipe passing through the upper part of the producer or steam-raiser, or opening directly into the atmosphere. As the producer, under the suction of the engine, draws in the air, a portion of the moisture passes in with the air. In arrangements of this kind the sleeve is usually lagged, to cause the heat to produce as much steam as possible; but, according to this invention, the sleeve is not lagged, in order that it shall act as a condenser and serve to check rather than increase the evaporating powers of the heat given off by the gas.



Whitfield's Power-Gas Producer.

In the arrangement of plant shown, use is made of a scrubber D, with its lower end open, mounted over an open casing or tank E. Between the scrubber and the tank is arranged an annular or cylindrical casing F, at its lower end open and at its upper end partially closed. It is supported by chains G and a weight H working over pulleys on the top of the scrubber. Between the casing and the scrubber and between the casing and the tank are flexible connections. Or, instead of flexible connections, the edges of the casing are water-sealed as shown; the lower end of the scrubber being formed with a lute, and the casing fitting into it. Owing to this flexible or water-sealed connection, the annular casing is free to rise and fall.

Passing up through the tank is the gas-delivery pipe J from the producer. As the gas accumulates in the scrubber, the casing F rises; while as the gas is drawn off the casing falls—thus causing the gas to pass to the engine at a uniform density; the falling of the casing compensating for the gas withdrawn.

The annular casing is balanced to suit the maximum pressure; therefore, when the pressure is exceeded or about to be exceeded, the casing rises and closes the inlet pipe, while when the pressure falls the casing is lowered and the inlet pipe opened. In this way, the admission of gas to the scrubber is automatically regulated.

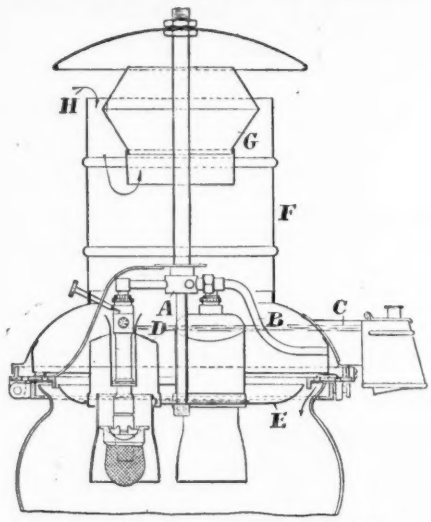
Inverted Incandescent Burner Lamps or Lanterns.

BLANCK, F., of Brussels.

No. 24,405; Nov. 4, 1907.

The object of this invention is to provide a simple igniting arrangement which will "avoid the disadvantages inherent to the employment of pilot or bye-pass jets and the complication of the arrangements;" also to provide "an improved construction of lamp embodying the improved igniting arrangement." The invention is based on the employment of burners having chimneys or uptakes provided with lateral openings in the plane of action of an igniting flame or burner in such a manner that when the gas is turned on to the lamp and passes through the burner chimney it meets the igniting flame at the height of the lateral openings, so that this flame ignites the gas, and combustion takes place downwardly in the chimneys until it reaches the burner proper.

The supply pipe from which the lamp is suspended carries a connection A having a number of lateral branches corresponding to the number of burners. To the connection is also attached a pipe B, which supplies the gas to a main igniter C disposed at the side of the lamp. The burners are each provided with two small chimneys or uptakes D, between which is formed an opening or chamber providing for the cooling of the bunsen burner which passes down through it. In order to ensure the independence of each of the burners and its retention in position, the central gas-pipe is extended downwards in the form of a rod, to which is secured a slightly convex plate E, acting as a reflector, and formed with circular openings in which the burners fit. The reflector is surrounded by a ring formed with air-admission openings and surmounted by a dome carrying, or formed with, a chimney F.



Blanck's Inverted Gas-Burner Lamp and Igniter.

The main chimney F is as small as possible consistent with the number of burners in the lamp. Inside the chimney, at the top, is mounted a vacuum chamber G, of double conical form—*i.e.*, composed of two conical portions united at their widest ends. The chamber is open at the top and bottom, and is disposed in the chimney with its portion of largest diameter slightly below the top of the chimney; a space being left between the inner wall of the chimney and the outer wall of the chamber. A curved deflector for the products of combustion is mounted on the gas-pipe above the chamber G.

The igniter C may be of the Menier type, comprising an igniting burner arranged to be turned on and lighted by a torch. The flame produced by the igniter should be conical in the case of a lamp having only one burner, and fan-shaped or expanded in the case of a lamp having a number of burners. The igniter is disposed, as shown, in such a way that its flame is directed horizontally at the level of the openings at the end of the burner chimneys D, or at the level of openings formed laterally in these chimneys, if these latter are of more than a certain length. Moreover, the openings should, of course, be so placed relatively to the igniting flame that they will be in the field of action of the flame when it is produced.

When it is desired to ignite the lamp, it is only necessary to turn on the igniter C and light it. The igniting flame then passes over or into the openings of the burner chimneys D and ignites the gas which rises in them when the gas-supply tap has been turned on—the gas then burning downwards in the chimneys to the burner proper. When the lamp is alight, the air entering through the outer ring of holes passes, in the necessary quantity, into the globe, through the inner ring of holes, to supply the burners; and the products of combustion escaping from the burner chimneys unite in the main chimney F and escape from it both through the double cone or vacuum chamber G and through the space surrounding it. In this way, a double vacuum effect is obtained which allows not only of reducing the size of the body of the lamp (and thus improving its appearance), but also of preventing any such detrimental action of the wind in the main chimney as would interfere with the regular draught of the lamp or deflect the igniting flame. In point of fact, it is said that the wind directed against the outside of the chamber G impinges upon the upper conical portion thereof, and, consequently, flows round the upper portion of the lamp; but, on the other hand, if suction should be produced in the vacuum chamber, its detrimental action in the chimney F can be compensated by the entrance of supplementary air through the top of the chimney—this air passing down between the top of the chimney and the outer wall of the chamber G, and then flowing up through the latter as shown by the arrow H, so that the effects of it are not communicated to the burner chimneys.

Gas-Lamp Lanterns.

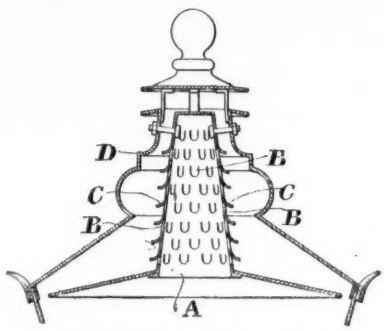
GUNNING, J., of Bristol.

No. 24,878; Nov. 9, 1907.

This lantern is constructed with a central chimney completely closed at the top and having a number of side openings for the passage of the combustion products of the lamp from the central chimney into the surrounding space, which is enclosed by an outer chimney or casing having lateral openings through which the gases escape to the atmosphere

—all arranged to prevent any downdraught, even when used in exposed situations.

As shown, the openings B in the inner chimney A have downwardly-inclined protecting screens C punched out of the walls of the chimney. The outer chimney D has lateral openings at the top about the level of the closed top of the inner chimney. These openings may be formed by supporting the cap or cover of the outer casing at a suitable distance above the upper edge of the casing.



Gunning's Street-Lamp Lantern.

The expulsion of the combustion products from, and the necessary up-draught through, the central chimney is assisted by currents of air which, entering the outer casing D through openings near the bottom, are highly heated, and rapidly ascend through the closed space surrounding the chimney, passing out to the atmosphere, together with the combustion gases, under the raised cover of the outer casing.

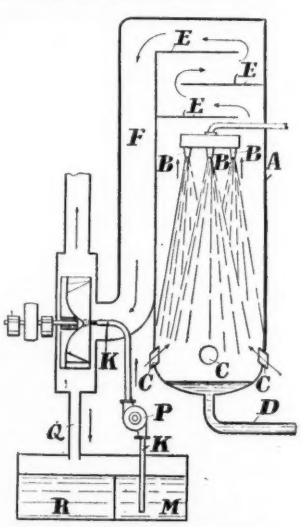
Treating Solutions Containing Ammonia.

FOUSSET, R., of Paris.

No. 25,311; Nov. 14, 1907.

It is known, the patentee points out, that any liquid containing dissolved ammonia in a free state on exposure to the air loses the ammonia in a time which varies with extent of surface of the liquid in contact with the surrounding air; and if the liquid be converted into a state of mist by atomizing it, the diffusion of the ammonia takes place very rapidly, although not instantaneously, however finely the liquid may be divided. In order to thus efficiently remove from the liquid the ammonia dissolved therein, it is therefore necessary that the surface of the liquid in contact with the air shall be as large as possible, and that the time of the contact shall be prolonged for a period sufficient to allow the ammonia to become diffused in the air surrounding the finely-divided liquid.

The object of this invention therefore is to provide a process, on these principles, for making ammoniacal salts in the cold, or at ordinary temperatures, and to provide apparatus for use in such process as illustrated in the accompanying sectional elevation.



Fousset's Ammonia Precipitator.

The ammoniacal solution is forced through a pipe at the upper part of a column A, and thence downwards through nozzles B, with sufficient force to atomize the liquid and form a wide conical spray or mist, extending across the column. This finely-atomized liquid descends against an ascending current of air drawn in at C and upwardly through the column. In order that the atomized liquid can properly part with its ammonia to the air, it should be made over-alkaline. The ammonia diffused in the finely-atomized liquid is absorbed by the ascending air; and the liquid which collects at the bottom of the column A is evacuated through a pipe D, and the air, laden with ammonia, comes in contact with baffle-plates E (at the upper part of the column) arranged so as to cause the liquid entrained by the air to deposit thereon and to fall therefrom to the lower part of the column.

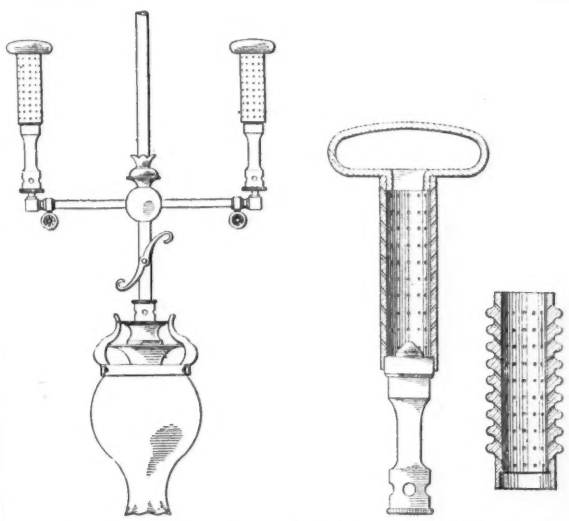
The air, laden with ammonia and freed from moisture, passes by a pipe or passage F from the top of the column A to the eye of a fan V on a spindle carrying a driving pulley. Into the eye of the fan opens a pipe K supplying the acid intended to form, with the ammonia with which the air is laden, the required ammonia salt. The acid is forced through the eye of the fan at the centre of the column of air, and enters the fan laden with ammonia. The casing of the fan has at its lower part a pipe Q, through which the liquid, laden with the ammoniacal salt formed, descends into a second vessel R, adjacent to the vessel M. Both vessels are preferably formed in one, separated by a partition, so that after deposition in the vessel R of such crystals of the salt as form, the supernatant liquid will pass over the edge of the partition into the vessel M, and be thence pumped back by the pump P into the fan, to be again charged with ammonia. In this way, the liquid is repeatedly enriched until the operation of the formation of the salt is completed.

Gas Heating and Illuminating Apparatus.

WELLINGTON, S. N., and GIBBONS, W. P., of Palace Chambers, Westminster, S.W.

No. 26,501; Nov. 30, 1907.

This invention refers to devices capable of being attached to any ordinary gas-fitting and utilized for heating purposes, while the same fitting may also carry burners for illuminating—not necessarily for use simultaneously.



Wellington and Gibbons' Heat Radiators for Gas-Brackets.

The illustration shows, by way of example, an ordinary pendant with an inverted incandescent gas-burner, and provided with branches carrying heating devices according to the present invention. The "heat radiators," in two forms, are shown separate.

The radiator consists of a tube of refractory material formed with series of inclined perforations, and shouldered at the base to fit on to the top of an ordinary atmospheric burner. On to the upper end of the refractory tube a cap is fitted which is larger in diameter than the tube, so that, when it becomes heated by the gas, "the particles of unconsumed or improperly consumed carbon" passing through the perforations strike against the highly-heated under-surface of the cap, and the combustion is thereby "completed." In some cases, the tube itself is made with a series of projecting flanges, the inclined perforations opening on to the surface of the tube immediately below them.

The patentees conclude by saying: By such an arrangement as described, a room may be either illuminated or heated, or both illuminated and heated as desired, by the use of the ordinary gas-fitting with the radiators attached, and the expense saved of fitting special supply pipes to gas-heating apparatus, as is common; and, also, the arrangement described presents the advantage that the heating devices may be removed and the same burners used for illuminating purposes.

Controlling the Gas Supply to Lamps at a Distance.

HIMMEL, G., of Tuebingen, Germany.

No. 7318; April 3, 1908. Date claimed under International Convention, Feb. 3, 1908.

This is a "Patent of Addition" to Patent No. 7309 of 1908—see "JOURNAL" for Sept. 29, p. 863.

One form of the apparatus there described comprises, for the purpose of controlling the gas supply, a cock of ordinary construction having a conical plug adapted to be rotated in its casing. But a cock of this kind (as the patentee points out) has the disadvantage that it is liable to wear through at the thinnest part, and thereby give rise to unnoticed leakages of gas into the atmosphere—a disadvantage obviated, according to the present invention, by the provision of a cock of spherical shape having its bore situated to such an extent below the axis of the cock that the spherical cock shall still make a tight joint above its bore. Such a cock "causes less friction and can be fitted with greater accuracy," while it is also capable of oscillating in every direction on its seat, after the manner of ball-joints, so that in case of inaccurate working or lateral play of the operating rod or spindle of the cock, the apparatus "will operate correctly and all jamming will be obviated." In case of wear, there will still be a tight joint at the lower part of the cock, because the ball will always bear upon its seat and make a tight joint at its lower part; so that, even if the cock should leak, the gas will at the worst merely leak around the ball to the burner, where it will be ignited, and "thereby draw attention to the leaky condition of the cock."

Manufacture of Fire-Bricks, Retorts, &c.

PAYNE, S., of Brighton.

No. 11,062; May 21, 1908.

This invention has for its object the combination of certain materials to form a composition which will increase the fire-resisting qualities of the articles named and "dispense with the process of burning or firing in a kiln in the manufacture thereof."

The following are the several materials of which the composition is formed: Sea sand sifted or as dug on the sea shore; flint, gravel, or silica; and gypsum or portland cement in given proportions—passed through sieves in a dry condition to ensure a thorough mixture. Then clay, as dug from the earth, is reduced to a slip condition by adding to it a strong solution of tar and water separately. Then the sand and cement as sifted are added thereto—thoroughly incorporating the whole together in a pug-mill or other mechanical means into a composition, which is moulded into fire-bricks, crucibles, gas-retorts, lining blocks for furnaces, and the like in the usual manner.

After the articles are moulded, they are placed on tracks or boards exposed to the weather to dry and set hard for use—the usual process of burning or firing in a kiln is entirely dispensed with, thereby reducing considerably the cost of manufacture.

Fire resisting articles made from the composition and dried by exposure to the weather only are said to possess greatly increased resisting power to the action of heat in a furnace.

Suitable proportions of the several materials are: Sea sand, 4 parts; flint, fine gravel, 1 part; clay, with tar solution, 1 part; portland cement, or gypsum, 1 part.

APPLICATIONS FOR LETTERS PATENT.

20,297.—CLUER, F. G., "Gas-regulator." Sept. 28.
20,304.—LAVENDER, H. E., "Pipe-unions." Sept. 28.
20,306.—BRIGG, T. H., "Gas-stoves." Sept. 28.
20,348.—BONNIKSEN, B., and BERRIDGE, T., "Automatic gas lighting and extinguishing." Sept. 28.
20,360.—KENT, W. G., and HODGSON, J. L., "Fluid meters." Sept. 28.
20,426.—TWIGG, A. C., and WARREN, H. C., "Gas-regulators." Sept. 29.
20,463.—STEVENSON, H. R., "Packing mantles." Sept. 29.
20,465.—BLAND, C. W., "Inverted burners." Sept. 29.
20,536.—BRANDES, A., "Standard for lamps." Sept. 30.
20,547.—HARTMAN, G. H., "Rotary reversible steam and gas engines." Sept. 30.
20,610.—KITSON EMPIRE LIGHTING COMPANY, LTD., and STEPHENS, R. H., "Incandescent vapour lamps." Sept. 30.
20,621.—NORTH, R. R., "Gas-governors." Sept. 30.
20,636.—HALEY, H., "Prepayment meters." Oct. 1.
20,663.—WILSON, J. W., "Bunsen burners." Oct. 1.
20,667.—LIEBISCH, R. J., and WOOLLEY, C., "Inverted gas-lamps." Oct. 1.
20,682.—KITTLE, H. A., "Removal of deposits of carbon." Oct. 1.
20,686.—ROWMER, J. J., "Gas-producers." Oct. 1.
20,690.—WINPENNY, A. R., "Pumps or meters." Oct. 1.
20,712.—BLAND, C. W., "Incandescent burners." Oct. 1.
20,746.—BRONISLAWSKI, B., "Condensing globe." Oct. 2.
20,762.—HELPS, G., "Gas lamps and burners." Oct. 2.
20,777.—JARRETT, J. A., "Manufacture of combustible smokeless and odourless gas." A communication from A. Graf. Oct. 2.
20,836.—EDEN, C. K. P., "Improvements relating to the production of light." Oct. 2.
20,850.—DEMPSTER, R., & SONS, LTD., and TOOGOOD, H. J., "Lids of gas-retorts." Oct. 3.
20,851.—DEMPSTER, R., & SONS, LTD., and TOOGOOD, H. J., "Charging of gas-retorts." Oct. 3.
20,864.—HAMILTON, J., "Meter pump." Oct. 3.
20,883.—BOULT, A. J., "Incandescent lighting." A communication from L. Hooker. Oct. 3.
20,920.—BURKHEISER, K., "Purifying gases and obtaining bye-products." Oct. 3.

Yellow Prussiate Plant for Halifax.—The Gas Committee of the Halifax Town Council have for some time past had under consideration the advisability of erecting a Davis-Neill plant for the extraction of cyanides and the manufacture of yellow prussiate. The decreased market value of prussiate led them to shelve the question a few weeks ago; but they have now definitely determined to instal a plant, subject to a suitable arrangement being come to with the makers.

Suicides by Gas.—On Monday of last week, the Manchester Coroner investigated the fifth suicide by gas poisoning in the city within a fortnight; and the Jury returned a verdict of "*Felo de se*." Agnes M'Cracken, aged 45, fastened the scullery door, turned on the taps of a bracket and stove, and sat down on a chair to await asphyxiation. At Cleckheaton, William Coates, who had carried on a small wire business, placed in his mouth one end of a rubber tube, the other end of which was attached to an open gas-bracket; and when discovered, he was dead.

Water-Works Purchase Question at York.—The York City Council have decided upon the appointment of a Committee to inquire and report upon the desirability or otherwise of the acquisition by the Corporation of the undertaking of the York Water Company; whether such acquisition would entail any, and what, charge upon the rates; and whether an arrangement could be made between the Corporation and the Company for the supply of water to citizens at rates which would encourage the use of baths in houses. Alderman Meyer, who moved the resolution to this effect, said he did not suggest that they should buy up the water-works; but it would be interesting to ascertain whether this operation would be such that it would be impossible to undertake it. He contended that the present method of charging was on a wrong basis, and that it was to their interest in every way to encourage the use of water.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Suggestions for Improvements in Gas-Lamps.

SIR,—Being indirectly connected with the gas industry, and interested in its advancement, when recently I had to fit out my house for gas, I endeavoured, as far as means and knowledge would allow, to instal fittings that would be a standing recommendation of gas for all branches of domestic heating and lighting. With the exception of smoothing-iron troubles, there has been little difficulty with the heating fittings—the geyser especially being all that could be desired. But to my dismay I have been utterly unable to find lamps that come anywhere near giving proper satisfaction. I append a specification of my idea of a perfect lamp, and I should be very grateful for any criticism of it, and, above all, for the names of any firms who supply fittings that come reasonably near complying with this specification.

Specification for a Modern Domestic Gas-Lamp.

1.—"Totally" enclosed, to protect from wind, dust, and flies, and allow the use of very small pilot flames.
2.—"Distance lighted," if possible without pilot-flame. Gas people do not seem to realize the importance of this item.
3.—As silent as possible, even at a slight sacrifice of flame temperature.
4.—(*a*) The device for regulating gas and air, and also the mixing-chamber, to be out of the path of the products of combustion. (*b*) Means to avoid flame "striking-back" from excess of air in the pipe beyond the mixing-chamber at the moment of lighting.
5.—Artistic design.
6.—The actual burner to be of non-conducting, non-corrodible material.
7.—No metal parts to be in the path of the products of combustion.
8.—"Removable" nipple, as with the "Ecliptic" fittings.
9.—(*a*) Means for securing the position of the air regulator to avoid alteration when dusting or handling. (*b*) Air-inlets to be such that they do not become diminished by the accumulation of dust. [Certain fittings, admirable from the point of view of delicacy and ease of air adjustment, give trouble from clogging of the narrow air-slits.]
10.—Glasswork to be of design and material to avoid breakage from uneven heating caused by damaged mantles.
11.—Price to be the very lowest possible.
12.—Gas consumption per cubic foot to be stated on each lamp, under agreed standards of gas, conditions, and test.

There should be a range of sizes of the different patterns. Some lamps should be designed to give the effect of standing out at an angle, as can be done with most electric lamps.

Possibly a governor should be fixed for each room, or one for the lighting installation.

Hart's Lane, Barking, Oct. 7, 1908. H. WILFRID CROW.

Water Board's Charges—Proposed Indignation Meeting.

SIR,—Indignation will not repeal an Act of Parliament. It is characteristic of the Englishman to look on indifferently while Parliament passes an unjust measure, and then to suddenly wake up and express his "indignation."

The citizens left one of their number (Mr. Samuel) to fight the Board single-handed; and when the chance arose of contesting, by appeal, the only point under the new Act which could possibly be raised, they again left Mr. Samuel quite unprovided with any aid, except such as is, I believe, called "moral" support, of which they were prodigal.

The oppressed ratepayer must wait until the Constitutional party are again in power. The present Government are too busy imitating the Board's methods.

As now managed—or rather mismanaged—the Board are bound to extort the last penny in order to pay, or try to pay, their way. The remedy is obvious—a reduction by at least 30 per cent. of the working expenses. This, to a great extent, can easily and properly be accomplished by an equitable adjustment of salaries. Some scores of officials can be entirely dispensed with; while the stipends of many of the highly-paid officers should, in fairness, be reduced 40 per cent. In a very few instances, the salaries must in justice be increased.

The present position of the Board is mainly brought about by keeping cats which catch no mice.

57, *Gracechurch Street, E.C., Oct. 5, 1908.* GEORGE KEBBELL.

The Lisburn Town Council and the Gas-Works.—At the meeting of the Lisburn Town Council last Tuesday, a resolution passed by a Committee that the Solicitor should be empowered to take the necessary steps to promote a Bill to enable the Council to purchase the gas-works and for other purposes was confirmed.

Public Lighting at Acton.—At the meeting of the Highways Committee of the Acton Urban District Council last Wednesday, a letter was received from the Gaslight and Coke Company stating that the 56 lamps supplied by them were kept alight for 4300 hours per annum, against the 3635 hours during which the lamps supplied by the Brentford Gas Company are lit. They said that if the Council were desirous that they should adopt the time table upon which the Brentford Gas Company work, they would reduce the charge for lamps fitted with a No. 4 Kern burner from £3 12s. 8d. to £3 5s. 9d. each per annum. This charge would be subject to an increase or decrease of 1s. 3d. per lamp in respect of each 1d. increase or decrease in the price of gas for street lighting. The charges for the various other lamps supplied by the Company would also be reduced proportionately to the size of the burner, if the number of lighting hours was altered as suggested. It was resolved to recommend the Council to accept the revised terms.

MISCELLANEOUS NEWS.

DEVONPORT GAS AFFAIRS.

Allegations Respecting Contracts—Congratulations for the Engineer.

The greater part of last Thursday's sitting of the Devonport Town Council was occupied in the discussion of matters relating to the Gas Department. At the outset,

Mr. STROUD, a member of the Gas Committee, asked what was the amount to date expended with Messrs. Willey and Co. on slot-meter installations, and, further, what was the total amount paid to the firm for the supply of materials and for work performed since the acquisition of the gas-works by the Corporation, inclusive of all slot-meter installations.

The TOWN CLERK said the amounts paid to Messrs. Willey and Co. from the acquisition of the gas undertaking to Sept. 24 last was as follows:—

	£	s.	d.
New automatic installations	34,255	4	2
Maintenance of installations (old contract)	1,841	18	0
Contract No. 4, cast-iron main pipes and appendages	4,468	13	1
Carburetted water-gas oil main	308	12	6
*Retort-house reconstruction (in progress)	4,000	0	0
Meters	2,806	0	9
Cookers	1,626	19	3
Sundry fittings (stores)	1,773	5	11
Repairing meters	476	0	7
Hire of men for reading meters	146	16	7
	£51,903	10	10

* The amount of this contract is £8276.

Answering Mr. Monk, the TOWN CLERK said it was not a fact that employees of Messrs. Willey and Co. were at one time engaged by the Corporation to collect money from slot-meters.

Mr. BISHOP, another member of the Gas Committee, asked what was the date of the meetings and who were the members of the Gas-Works Sub-Committee who ordered the contract to be made with Messrs. Willey and Co. for the supply of auto-slot installations.

The TOWN CLERK: I cannot find any record of the minutes of the Gas-Works Sub-Committee or of the Gas Committee ordering a contract with Messrs. Willey for supply of auto-slot installations.

Mr. BISHOP: Was the contract ever confirmed by the Council, and, if so, what was the date of the meetings?

The TOWN CLERK: I cannot find that the contract was confirmed by the Council, or that its terms were disclosed in the minutes of the Gas Committee. On the minutes dated July 30, 1903, the following appears: "Automatic Gas Installations.—The Deputy Town Clerk reported that the agreement between Mr. H. A. Willey and the Corporation as to automatic gas installations had been executed by him."

Mr. BISHOP: By whose authority did the Mayor of the borough at that time sign and seal this contract?

The TOWN CLERK: I am informed that the Deputy Town Clerk, acting upon instructions, submitted the contract to the Mayor for sealing.

Mr. BISHOP: If the Mayor signed the contract without authority from the Council, can he be held responsible for his action?

The TOWN CLERK: The signature of the Mayor to the Contractors for the purpose of attesting the sealing. Under the circumstances mentioned, I cannot see that the Mayor incurs any personal liability.

GAS ENGINEER'S RESIGNATION.

In the minutes of a meeting held the previous day, the Gas Committee reported that they had received a letter from Mr. J. W. Buckley, stating that he had accepted the post of Engineer and General Manager of Hornsey Gas Company, and tendering his resignation. The Committee accepted the resignation; congratulated him upon his appointment; and recorded an expression of the Committee's high appreciation of his zeal and ability. It was also decided that the Council be recommended to authorize the Committee to issue an advertisement for the appointment of Gas Engineer and Manager, and to select three candidates to appear before the Council; the salary to be £400 per annum, increasing by annual increments of £25 to £500; age not to exceed 45 years; the appointment to be determinable by three months' notice on either side; and the gentleman appointed to devote the whole of his time to the duties of the office.

The MAYOR (Mr. R. Smerdon) said Mr. Buckley had served the Corporation well. They were pleased that he had obtained a more important appointment; but they were very sorry to lose his services. He had heard with pleasure that, though Mr. Buckley was going away, his interest in the gas undertaking of Devonport would not cease.

THE RETORT-HOUSE CONTRACT.

Among other minutes of the Gas Committee was one recommending that two certificates of £1000 each be granted to Messrs. Willey and Co. on account of the retort-house contract. Mr. Stroud moved that this matter be referred back to the Committee. He explained that he had been to the Town Clerk's office to examine the minutes of the Gas Committee for another purpose when he came upon a minute across which was written "For Works Sub-Committee only." This stated that the Sub-Committee met on June 4, 1908, when the Engineer reported that he had had occasion to call Messrs. Willey and Co.'s attention to discrepancies in the construction of the retort-house; and he had written the firm and had got their reply. Following this up, he (Mr. Stroud) went to the Engineer and obtained a copy of the letters. Mr. Stroud proceeded to read the letters, from which it appeared that Mr. Buckley had complained to the Contractors that in the arch principals of the retort-house roof there were departures from the specification in the pitch of the rivets, and that in another case the rivet holes were not true. Messrs. Willey replied, admitting that the pitch of the rivets was 4⅜ inches, instead of 4 inches as specified, expressing regret that an error had been made, but submitting that the stability of the structure would not be affected. The other matter would be rectified; and the firm hoped that their explanation would be accepted as being satisfactory. Mr. Stroud said that in his judgment the matter should have gone before the Gas Committee as a whole; and that it had not was manifestly unfair to the members, who were expected to take equal responsibility in the matter. He was delighted that the Engineer had been alert, and had discovered the discrepancy; but he protested most strongly against the information being withheld from the Committee and the Council. He agreed with what had fallen from the Mayor about Mr. Buckley, who had managed the works most efficiently.

Alderman WAYCOTT asked what action the Works Sub-Committee took on the matter being reported to them.

Alderman HORNBROOK, the Chairman of the Gas Committee, said he gave Mr. Stroud credit for the belief that he had found out something wrong; but it was a case of the mountain in labour which brought forth a mouse. The fact was that Mr. Stroud had not been present at the meetings of the Committee of which he was a member. It was the Engineer who suggested that there should be written across the minute "For Works Sub-Committee only." He said that the matter was not of importance, though it ought to be put on record. He said it was, on the whole, a splendid piece of work; and Alderman Smith and Mr. Jenkin, who spoke as experts, agreed that it was. Mr. Jenkin said that if it would help his case he would not have another hole put in. Mr. Buckley pointed out that there were fewer rivets than there should have been; and it was agreed that he should make a calculation and deduct the difference from the bill, and that there the matter should rest. How many of them would have acted differently under the circumstances? Would they have gone against the advice of the Engineer whom they all admitted was one of the finest in the country? He was asked if it was a case in which the work should be sent back, and his reply was that no one but a fool would think of sending it back. He had had three and a half years' experience of Mr. Buckley and his work; and he had no hesitation whatever in acting on his suggestion.

Mr. FREDMAN asked if Mr. Buckley took the responsibility of saying there should be no mention of the matter to the Gas Committee.

Mr. JENKIN said he had visited the works two or three times a week during the building of the retort-house. The rivet holes were not exactly right in the cases referred to; and Mr. Buckley pointed it out, and it was altered. If the work had been as defective as Mr. Stroud tried to make out, the Engineer would not have allowed it to go on. In his opinion, it was a splendid job.

Alderman PAUL contended that the Sub-Committee had acted quite in accordance with the usual practice of Sub-Committees of the Council. As to the Engineer, they had only to think of what the works were when he came, and contrast this with what they were now, to appreciate his services.

Mr. GEORGE agreed that the Gas Engineer had done his duty in pointing out the discrepancies between the specification and the construction; and he had no doubt Mr. Buckley would see that the right deductions were made. At the same time, they had the assurance of Mr. Jenkin that the work was not lessened in strength or durability by the rivets being not so close together as was specified.

Mr. MONK expressed surprise that the Engineer should have consented to the matter being referred to the Sub-Committee only, and asked if this statement was correct.

Mr. BUCKLEY said the statement required a little qualification. From time to time matters had been discussed in Sub-Committee which, in his opinion and the unanimous opinion of the Sub-Committee, it was not in the best interest of the town should go forward for open discussion. In this instance, he was firm in requiring that a minute should be made of these discrepancies, because the work was one which would stand for many years, and at some time or other attention might have been called to this departure from the specification. He called the Sub-Committee's attention to it, but it was felt that if it went to the Committee a lot might be made of it, perhaps more than was necessary. He said: "Well, if you feel there is going to be a rumpus over this, you can do with this as with other minutes—write across 'Works Committee only.'" There were discrepancies; but he did not think that they were so serious as perhaps they would appear to the lay mind.

Alderman P. C. GOODMAN said Mr. Jenkin told them that the structure was not weakened. But Mr. Jenkin knew from experience that in the Dockyard deviation from the specification for 100th part of an inch would not be allowed, and here they had the pitch of the rivets altered from 4 inches to 4⅜ or 4½ inches. Under the circumstances, this money should not be paid to the Contractors until they knew exactly where they were.

Alderman HORNBROOK said the money had been actually paid. The Council had no right to retain it in face of the Engineer's certificate that it had been earned and was due.

Mr. STROUD withdrew his motion; and the minute was confirmed.

SLOT-METER CONTRACT.

Mr. FREDMAN drew attention to another minute in which Aldermen Hornbrook and Paul were appointed a deputation to wait upon Messrs. Willey and Co. as to the contract for automatic installations.

Mr. BUCKLEY said that at the meeting of the Sub-Committee on Sept. 3, a discussion on the automatic meter question was raised by Mr. Stroud, who proposed that a deputation should wait upon Messrs. Willey to go into the matter; but, unfortunately, the proposal was not accepted. After Mr. Stroud left, the Committee suggested, he believed unanimously, that Mr. Hornbrook should interview the Contractors. Then he (the Engineer) said: "I am going to Exeter to-morrow to interview the Contractors on another matter, and if it is convenient you might as well accompany me; but I think a third member should go." So one member suggested Mr. Paul; and he strongly endorsed it, because he knew that the position Mr. Paul had taken up was rather antagonistic towards the Contractors. The minute was not recorded; but at the following meeting of the Gas Committee the Chairman made it known that they had been to Exeter, and the minute was added at the suggestion of the members of the Committee.

Mr. STROUD said that when he moved that a deputation should wait on Messrs. Willey and Co., he could not get a seconder for the motion,

What he gathered from the reading of the document was that an agreement was entered into with the firm in 1903 that after five years they should pay Messrs. Willey and Co. 4s. 8d. per year for every slot meter installed in the borough. Up to last March, the number installed was 8608. He asked how much that was likely to cost for the next five years for which the contract had to run, and was told about £10,000. The Engineer also informed him, in answer to his questions, that the cost of the gas supplied through slot meters, including interest and all other charges, was 3s. 3d. per 1000 cubic feet, and that the revenue was 3s. 4d. He calculated that the addition of this 4s. 8d. per annum for the maintenance of the slot installations would be equivalent to 5¾d. per 1000 cubic feet, which would bring the cost up to 3s. 8¾d. per 1000 feet, and leave them with a deficit of 4¾d. for every 1000 feet of gas which went through the slot-meters. Last year they had, under the best conditions experienced since the Corporation took over the works, a profit of £740. If, now, they were to be saddled with an extra charge of £2000 a year for maintenance, where would they be? They clearly ought to see if they could not get out of the agreement—an abominable one for the ratepayers. He had seen the draft agreement drawn up by the late Engineer, and in it there was a proviso to review the agreement every five years. This, however, dropped out in some mysterious way before the agreement was signed, and no record was to be found in the minutes of the matter having been ever discussed and approved. The members of the Sub-Committee knew nothing until they asked to see the minutes; and then they found that an agreement had been entered into, that a clause which the late Engineer took the trouble to put in was struck out, that the whole thing ran for ten years, and the Council had no option, nor could they go elsewhere for slot installations.

Alderman HORNBROOK said the speech of Mr. Stroud was unfair and untrue. They were told that, under this agreement, they were going to lose £2000 a year; but their own Engineer had said that if they were to take the work of maintenance out of Messrs. Willey's hands and do it themselves the cost would be £1000, so that at the worst the loss would be £1000 a year. Although they would be paying 4s. 8d. a year for the maintenance of the slot-meters, they must remember that for five years it had been done free of cost.

Mr. TOZER moved that a Special Committee of eleven members be appointed to investigate the agreement and report to the Council. He explained that it had been discovered that when he was Mayor of the town he witnessed the sealing of this document, which he certainly now did not think was in the interest of the town. He did not cast any blame or reflection upon the Gas Committee; but he said on the Chairman of the Gas Committee there stood a great responsibility. On April 16, 1903, the Gas Sub-Committee instructed Mr. Stevenson, then their Manager, to prepare a draft scheme. It was submitted on April 30 to the Gas Committee. In the scheme there was a protecting clause which would give an opportunity to the Corporation to relinquish the contract at the end of the first five years. This was the only instance he could find where the Committee dealt with the agreement. Nothing further appeared in the minutes as to what became of the contract until at a meeting on July 30, 1903, the Deputy Town Clerk reported that the agreement between Messrs. Willey and Co. and the Corporation had been executed by him. The agreement was for ten years certain; and the protecting clause had been deleted. There were no records that he could find of the Sub-Committee.

Alderman HORNBROOK seconded the motion for the appointment of a Committee. He could not understand why there were no references in the minutes to the agreement unless it was because the minutes of the Sub-Committee were not regularly entered, as was the fact at that period. The Committee had not entered into a single contract except at the lowest figure at which the tenders had been made; and Messrs. Willey and Co. tendered like other people. Their meters were as good as any, and were 15 per cent. cheaper.

Alderman P. C. GOODMAN moved, as an amendment, that the Town Clerk write to the Board of Trade to send down an Inspector to hold an inquiry.

The TOWN CLERK said that, so far as he knew, neither the Board of Trade nor the Local Government Board had any power to send down an Inspector to hold an inquiry; and if one were sent, he could not administer an oath or call witnesses.

Mr. Tozer's motion was carried; and a Committee was appointed.

THE APPOINTMENT OF GAS ENGINEER.

Mr. FREDMAN moved that the minute with reference to the insertion of advertisements for a gas engineer in place of Mr. Buckley be referred back to the Committee. It was proposed to give the present Gas Committee power to select three candidates to appear before the Council. In his opinion, the whole question of the appointment ought to rest with the new Committee and the new Council after the November elections.

Alderman LITTLETON, in supporting the amendment, said that Mr. Buckley was under agreement to give them th ee months' notice; and though he was anxious to take up his new duties as soon as possible, they were bound to recognize the fact that no one could carry out the supervision of the reconstruction of the retort-house so well as he could. If Mr. Buckley gave them part of his time, it would be better possibly than having on the works a man who was wholly new to the contracts in progress.

The amendment to refer the minute back was defeated by 24 votes to 21; but a further amendment by Mr. Monk, to offer a commencing salary of £350 per annum, rising by annual increments to £450, was accepted by Alderman Hornbrook and agreed to.

MR. BUCKLEY'S THANKS.

At the close of the meeting,

Mr. BUCKLEY thanked the members of the Council for the kindly references to himself. When he came to Devonport he knew he was tackling a most difficult job; but the working results of the undertaking had exceeded his most sanguine anticipations. If he could at any time render the Council assistance or advice, he should be pleased to do it. He would also give any assistance that he could to the Committee who had been appointed to hold an inquiry respecting the slot-installations contract. It was a curious fact that that day's meeting, which was probably the last meeting of the Council he should have the opportunity of attending, was the most unpleasant which had been held during his experience of Devonport. As to a remark which had been made by Mr. Martyn, he would like to say that it was not at his instigation that the words "For Sub-Committee only" were entered in the minute book. He could not allow Mr. Martyn or anyone else to cast any stigma upon anything he had done with reference to the Gas Department of the Corporation.

RAMSGATE CORPORATION GAS SUPPLY.

A Question of Coal Contracts.

At a Meeting of the Gas and Water Committee of the Ramsgate Corporation recently, the Chairman (Mr. Coleman) said there was one matter arising out of the minutes to which he wished to refer. It would be within the recollection of members that at the previous meeting the Committee accepted the tender of the Pelaw Main Colliery Company for coals, and it was then stated publicly that by so doing there would be a loss to the town of something like £200. There was another tender at 5d. a ton less than that of the one accepted. Though an explanation was given in publ c of the reason for the Committee's decision, the facts were not fully reported, and there seemed to be some erroneous impression abroad that the Corporation had favoured one company to the detriment of another. They were not there to show favours to anyone, but to do the best they possibly could for the benefit of the public. They acted as they did from the fact that they knew nothing about the second kind of coal, while that of the Company whose tender had been accepted they knew perfectly well, having been in the habit of using it for a great many years. In the analysis they had sent out to some members of the Council, it was shown that the second coal, when put to the test, yielded 11,000 cubic feet of gas per ton. Everyone knew, of course, that when carrying out a laboratory test of coal the persons making it endeavoured to get every cubic foot of gas they possibly could out of a ton; whereas, if members looked at last year's statement of accounts they would find that the Corporation gas represented a yield of 11,518 cubic feet per ton. Thus the Corporation, saving Pelaw Main coal, got an extra yield of 500 cubic feet per ton, saving the town something like 1s. 4d. per ton of coal carbonized. It could be easily shown that, instead of losing about £200, as had been stated, by accepting the Pelaw Main Company's tender, the fact was that the Corporation would have lost £458 by accepting the other one. He considered these were facts which ought to go forth to the public, in order to show that the Corporation were studying the best interests of the ratepayers, and were getting as good a yield out of the gas-works as possible. The Deputy-Mayor remarked that the whole matter lay in a nutshell. Though the Corporation lost 10,000 fivepences, they really effected a gain of a like number of elevenpences.

STOCKPORT CORPORATION GAS SUPPLY.

Proposed Special Discounts to Manufacturers.

At the Meeting of the Stockport Town Council last Wednesday, the minutes presented by the Gas Committee set forth that a letter had been received from the Fine Cotton Spinners' and Doublers' Association, Limited, renewing their application for a reduction in the price of gas used for manufacturing purposes, and asking that the whole of their Stockport mills might be treated as one consumer. The Committee had had before them a report by the Engineer (Mr. S. Meunier) on the question of allowing discount to large consumers and those using prepayment meters; and, after fully considering it, it was resolved that the following scale of discounts should be adopted: Over 500,000 but under 1,000,000 cubic feet per annum, 1d. per 1000 cubic feet; over 1,000,000 but under 2,000,000 cubic feet, 2d.; over 2,000,000 but under 3,000,000 cubic feet, 3d.; over 3,000,000 but under 4,000,000 cubic feet, 4d.; 4,000,000 cubic feet and upwards, 5d. The allowances were to be made in conjunction with the different discounts on the number of hours of working at present in force, but subject to the rule that the two discounts together should not reduce the price of gas lower than 1s. 3d. per 1000 cubic feet within the borough, and 1s. 6d. per 1000 cubic feet beyond it. It was also resolved that an additional discount of ½d. in the 1s. should be allowed to automatic meter consumers; and that the Cotton Spinners' Association should be informed that the Committee could not agree to treat all their mills as one consumer.

The adoption of the minutes having been moved,

Mr. SIMPSON remarked that if the Gas Committee could afford to make a reduction in price to the large consumers they should do so all round. He moved an amendment that the minute relating to the trade discounts be referred back to the Committee pending a report as to the number of consumers to be affected by the proposed alteration, and as to the possibility of granting an early all-round reduction.

Mr. R. FAIRHURST, in seconding the amendment, characterized the proposed reduction as one-sided.

Mr. S. BREWSTER described the amendment as selfish and contradictory. Mr. Simpson was in favour of a general reduction in the price of gas. Why, then, should he not allow this particular reduction to take effect, and then ask later that the Gas Committee be requested to carry the matter farther. If the reduction were not granted to the large consumers, they would be handicapping the trade of the town; and it should be remembered that in this particular branch of the gas industry there was growing opposition. The Gas Committee had not the monopoly of the supply of gas, as small gas plants could be put down in anyone's backyard. It was to combat this competition that the Committee had been induced at this stage to grant a little reduction in the price of gas used for power purposes. He sympathized with an all-round reduction; but surely they must not let one section of the consumers wait until everyone could be considered. It was in the interests of the town that manufacturers should be able to get gas for power as cheaply as possible.

Mr. J. FERNLEY (the Chairman of the Gas Committee) said that if

the Committee adopted the policy laid down by some people there would be no profits from the gas undertaking to distribute. He strongly objected to members of the Council getting up and making speeches about something of which they knew nothing; and he thought the Council ought to realize that the Gas Committee, who had the management of the gas-works in their hands, were fully alive to their responsibilities, and knew what was in the best interests of the town. They had considered this matter for twelve months, and the reduction had been forced upon them by the increased competition of suction gas. It was very important that the Committee should maintain the day-load; and it was the large consumers who enabled them to do it. They therefore offered a reduction to them; and they could not do this without making some allowance to the users of automatic meters. There was a policy of economy which was ruinous; and the Committee were not going to adopt it. They were quite unanimous in their decision; and he thought it unfair that the Council should seek to take from them the responsibilities with which they were entrusted.

Mr. G. NIXON assured the Council that the Committee were not at present masters of the situation. There were suction-gas plants which were being used pretty generally, and they were in competition with the Committee, who had felt themselves obliged to reduce the price of gas for power purposes to compete with them. If they were beaten in the price of gas for power, it would be a serious matter; and he considered that the Chairman of the Committee and the members were doing the right thing in making the reduction.

Alderman WHITE took a similar view. He pointed out that the large consumers used gas all the year round, and said it was necessary that the Committee should give them some relief.

Eventually, Mr. Fernley agreed to take the matter back, but assured the Council that the Committee would persist in making the reduction.

OTTOMAN GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C., for the purpose of confirming a resolution with regard to the number of Directors which was passed at an extraordinary meeting held at the conclusion of the half-yearly meeting last month.

The CHAIRMAN (Colonel James Le Geyt Daniell) proposed—"That Article 81 of the Articles of Association be, and is hereby, rescinded; and that the following Article be, and is hereby, substituted in lieu thereof: (81) That the number of Directors shall from time to time be determined by an extraordinary general meeting; but until any other number is so determined, there shall be five Directors." He said no remarks were necessary, as the resolution was merely to confirm one already passed.

Mr. A. M. PADDON seconded the motion; and it was unanimously agreed to, without discussion.

HYTHE AND SANDGATE GAS COMPANY.

The Methane-Hydrogen Plant.

The Annual General Meeting of the Hythe and Sandgate Gas Company was held on the 29th ult.—Mr. T. NOAKES in the chair.

The SECRETARY (Mr. H. Stainer) having read the notice convening the meeting, the report of the Directors for the year ending the 30th of June last was presented. It set forth that, the results obtained in the preceding year having proved anything but satisfactory, the Directors, in September, 1907, called in Mr. C. B. Tully to advise them as to the improvement of the works; and, on his recommendation, a methane-hydrogen plant was forthwith ordered. It was completed in November; and had given most satisfactory results; in fact, without it the supply of gas would have been seriously interfered with by the failure of the old retort-benches. Beyond this, the Directors, acting also on Mr. Tully's advice, had erected three new arches of retorts on the regenerative system, fitted with hand charging and drawing machinery, two of which had been in operation since May. They had also appointed a new Works Manager, and engaged an experienced Superintendent to take control of the distribution work generally; and it was their intention, as soon as opportunity offered, to rent a show-room, workshop, and store in the town, so that this department could be managed quite independently of the works. It was impossible, in the statement of accounts now presented, to show the effects of these improvements; but Mr. Tully had reported that, on a most moderate calculation, the working profits would amount to a sufficient sum to provide a dividend on the ordinary capital in addition to the interest on loans and debentures. Beyond the economies of working, the Directors were pleased to report a gratifying increase in the demand for gas. The scope for further development was undoubtedly very large, and would be taken advantage of at the earliest possible moment. With regard to the accounts, the Directors had obtained a report from Messrs. Wood, Drew, and Co.; and, on their advice, various changes had been made in the form—the most important being the restitution to the profit and loss account of a sum of £1500 previously transferred to the capital account. The revenue was £5157; and the expenditure, £6514. The total make of gas was 26,262,500 cubic feet. During the year the Directors had lost by death Mr. Thomas Amos, and had elected Mr. Percy Griffith, M.Inst.C.E., to fill the vacancy on the Board.

The CHAIRMAN, in moving the adoption of the report and accounts, said the works were in a much better position now than they had been for many years. The two benches of retorts on the regenerative system now in use had been doing as much work as the five old ones had done. This meant great economy in the cost of production; and it was now possible to get 2000 cubic feet more gas per ton of coal than they had done under the old system. This would materially improve their financial position.

Mr. GRIFFITH, in seconding the motion, said the Board were working together most amicably and enthusiastically in order to place the

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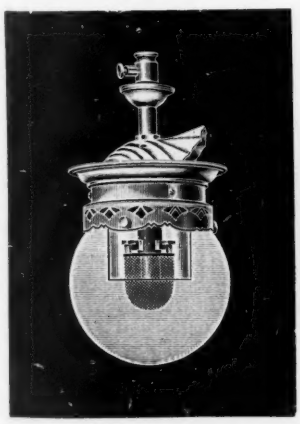

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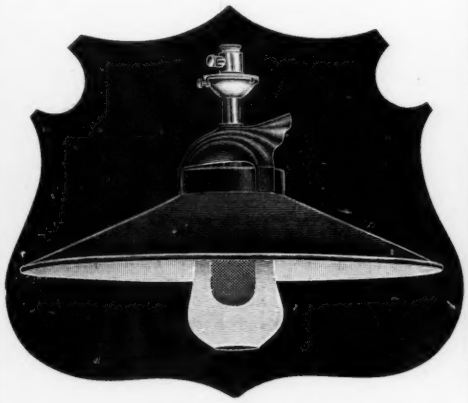

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Company in the position it ought to occupy. They had been striving, first of all, to put their works in a condition to enable them to give an adequate supply of gas at a good pressure; and the reports they had received from their Superintendent of Distribution and the consumers had been entirely satisfactory. Their efforts were being met by an increased demand for gas. Referring to the competition of the electric light, he said, speaking from a good experience of gas undertakings, that this was no trouble whatever except in cases where it was supported by municipal funds on an unprofitable basis; and this was not the case entirely in Hythe. Having mentioned a few features of the Company's progress during the year, Mr. Griffith pointed out that the balance-sheet did not show the position of the Company at the present moment; for since its issue almost all the principal items on the expenditure side had been relatively decreased, and nearly all those on the revenue side relatively increased.

After a few remarks, the motion was carried unanimously.

The retiring Director and Auditor were then re-elected; and the proceedings closed.

INDUSTRIAL PEACE AND INDUSTRIAL EFFICIENCY.

Sir Christopher Furness on Labour Co-Partnership.

On the invitation of Sir Christopher Furness, M.P., a conference of Trade Union organizations engaged chiefly in the shipbuilding and allied trades was held at West Hartlepool last Wednesday, under the presidency of the MAYOR (Alderman Robson), at which important proposals were submitted for settling on a permanent basis the shipbuilding dispute. They were contained in an address by Sir Christopher, which calls for notice in our columns at the present juncture, as it emphasizes the views so frequently expressed by the late Sir George Livesey on the relations existing between capital and labour. There were nearly 140 delegates present, including Mr. William Thorne, M.P.

Sir Christopher Furness began by explaining that he had invited the delegates to meet him in order that they might confer in a friendly way upon the present exceptionally grave crisis in the shipbuilding industry. His hope was that they might be able to arrive at a method whereby the relations between capital and labour might henceforth proceed upon a more harmonious footing. With the masters in one corner and the men in another—with forces opposed in battle array which ought to be in co-operation—the old basis was played out. These close federations outside the works spelt ruin to the shipbuilding industry. What was needed to-day was federation inside the works—a federation of goodwill between masters and men, harmony instead of discord.

The active forces of the industrial world were usually represented as twins—capital and labour. But, for his part, they always resolved themselves into a trinity—enterprise, capital, and labour—no one of which could well do without the other. When capital and labour came together at the summons of enterprise, they did not come together on the same footing, for labour was not in a position to share in the risks which capital could afford to accept. Labour wanted a ready market; it must be able to dispose of its product quickly. The provision of this ready market was one of the services that capital rendered, and for which it had to be remunerated. He was convinced that the only basis on which capital and labour could enter into relations primarily was that of buyer and seller of a commodity called labour, and that all attempts to produce more satisfactory co-operation between the two forces must rest upon a recognition of this great central fact. Friction had become chronic in the shipbuilding industry; and, thanks in large part to their strikes, sectional and general, the trade of the district—perhaps, even, the trade of the country—was in grave danger of being seriously damaged for a long period.

After discussing and dismissing the alternative of the employment of unorganized labour, Sir Christopher Furness proceeded to submit to the conference the two sets of proposals he had to make. First, he said, Why should not the Trade Unions, being capable, organized, powerful bodies, go into the business on their own account? They had the capital and the organizing capacity—why not? "I offer to your Unions, either singly or in combination, to hand over to them our shipyards at this port as going concerns for such sum or sums as may be determined by a recognized firm of assessors, appointed by joint nomination. My Company would not be exacting while you were in the preliminary stages; for part of the purchase-money we would allow you ample time in which to turn round, and myself and my representatives would readily convey to you all the information at our command, and such suggestions as might prove of service." Having regard to the conditions of the industry, it was possible, he said, that upon consideration they might perceive certain difficulties and disadvantages calculated to prevent them from accepting this proposition. In such case there was before them his second proposition: "I invite you to become limited co-partners in these shipbuilding yards, as distinct from the shipowning and other ramifications of the firm of Furness, Withy, and Co., Limited, on conditions which I will now state. The initial condition is that the employee partners should prove their good faith by becoming holders of special shares, to be called employees' shares, in the capital of the Shipbuilding Company owning the Middleton Shipbuilding Yard at Hartlepool and the Harbour Dockyard at West Hartlepool, under my chairmanship—paying for such shares by agreeing to a deduction of 5 per cent. from their earnings until the total amount of their shares is covered. For the 5 per cent. deduction so invested in the special shares I have named, you would receive—whether or not the Company divided any surplus profit—4 per cent. per annum as fixed interest. Such an arrangement would not interfere in the slightest degree with a workman's freedom of action, while a workman leaving the service of the Company would be able to sell his shares to one or more of his fellow-employees at an assessed, or it may be, an arbitrated, value, based on the market price of the day."

Sir Christopher went on to explain that the works would continue

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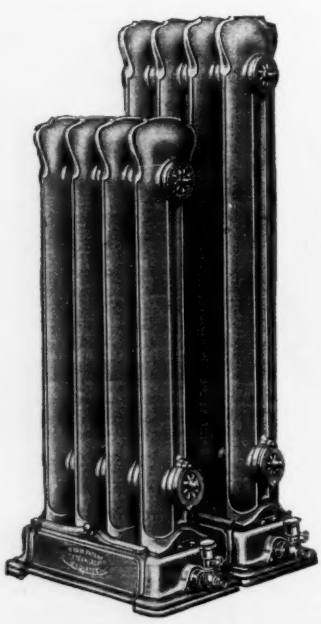

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to be under the control of a Board of Directors, with the supreme power, as at present, vested in the Chairman and Managing-Director of the Company. On the other hand, the attitude of the Company towards Trade Unionism or the Federation of Employers would not be altered; and hours of labour, rates of pay, &c., would be governed as at present, with one essential difference. While the employees would continue to work and be paid according to Trade Union regulations and rates, and would receive the 4 per cent. fixed interest on the shares which they had bought on the easy-payment system, there would be divided between them, as holders of employees' shares and of the ordinary shares in the Company, whatever sum might remain after the apportionments for interest on the capital (5 per cent.) and the depreciation, reserve, and development funds had been provided; such amount being shared between them on the basis of their individual holdings, in addition to the fixed minimum interest of 4 per cent. per annum. If, by reason of fat reserve funds, the shares of the Company rose in value, their own shares would benefit by similar accretions. In this way they would receive, not only a portion of the profit made upon their own labour, but also a share in the sums won by the foresight and initiative of enterprise and the staying power of capital. He proposed to set up a Works Council composed of an equal number of representatives of employees and of the firm, as a kind of Court of Reference and Committee of Counsel rolled into one. Its chief purposes would be the promotion of friendly communication between the firm and its labour partners on all affairs of common interest; and an important part of its duty would be to take into consideration on the instant, before any ill-temper had entered into them, all matters or incidents calculated to breed friction in all or any of the departments of the establishment. In addition to a representative from each trade employed in the works, he had invited to this "family council" the Secretaries or local representatives of the numerous Trade Unions in the area who had members engaged in the works.

In bringing his address to a close, Sir Christopher said he was most anxious to introduce such a community of association and interest that differences and disputes would be improbable; but should they arise, despite all precautions, that they should be carried through to a settlement without those irritating and inflaming interruptions of business which entailed such costly punishment upon all, whether employer or employee. "In a sentence," he said, "it will be an imperative condition of the agreement that I propose to you that, under no circumstances whatever, shall the employee co-partners go on strike against the directions and decisions of their co-partners governing the administration of the business; that, whatever be the causes of complaint that may arise against the management, the labour co-partners shall, by their representatives, submit their objections in a friendly spirit, through the channel for friendly intercommunication duly provided; and that every effort and artifice of amity shall be used by both parties to the dispute to bring it speedily to a close on the basis of mutual satisfaction and good-fellowship—it being understood always that a strike would overthrow the system." He added that if the methods of conciliation provided by the Works Council (or Committee of Counsel) failed to attain their object, the controversy in all matters in the major category would be left to be settled by a Court of Arbitration, to be composed of three members from either section of the Works Council and a Referee (conceivably the County Court Judge for the district) nominated by the Works Council; or, if preferred, a Court could be set up in the fashion provided by the machinery recently established by the President of the Board of Trade.

At the close of the address, several questions were put; one being by Mr. Thorne, who wished to know whether it was proposed to make membership of a Trade Union compulsory. Sir Christopher Furness replied that it would be left to the individual. He added that he recognized the difficulty of the question being duly considered by the societies; but time was pressing, and it was necessary that something should be done quickly.

He concluded by making an appeal to the delegates to discuss the matter impartially, and to let him know the result by the 26th prox.

METROPOLITAN WATER BOARD.

At the Meeting of the Metropolitan Water Board last Friday (the first after the summer recess), the Finance Committee presented a report on the Metropolitan Water "B" stock redemption funds. They stated, in connection with the recent issue of £1,500,000 of this stock, that it was necessary for the Board to determine the basis upon which contributions to redemption fund should be set aside in respect of that portion—viz., £1,491,594—for which provision must be made forthwith. Two alternative methods were laid down by the stock regulations; and the choice rested with the Board, but was subject to the consent of the Local Government Board. The first method, which provided for contributions on the instalment or non-accumulating principle, involved a high charge against revenue in the early part of the period assigned for the repayment of loans; but this charge gradually diminished by reason of the interest earned or saved, as the case might be, by the investment or application of the instalments throughout the period. The other method provided for contributions on the accumulating or sinking fund principle, under which an equal charge would fall upon the revenue account each year; the principal sum contributed being such as would (together with the accumulations credited year by year) produce at the close of the period assigned the sum originally borrowed. The Committee recommended—"That, subject to the consent of the Local Government Board, contributions to the redemption fund in respect of the debt created by the issue of £1,491,594 14s. 3d. Metropolitan Water 'B' stock on May 7, 1908, be made by (1) such equal annual sums as, being accumulated at compound interest at 3 per cent. per annum, would, after payment of all the expenses, make up a sum equal to the nominal amounts of stock in respect of which the said sums are carried to the account; and

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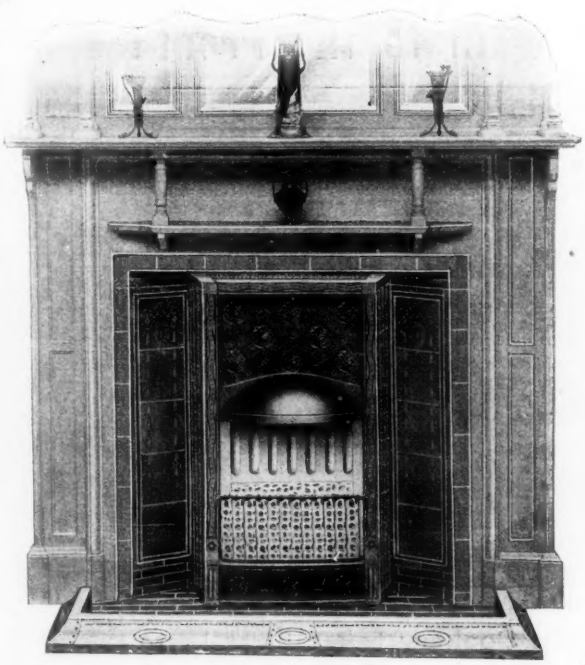

View of ordinary Fireplace, showing the Patent "N.V." Gas Fire in position.

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(2) accumulations of the said equal annual sums at compound interest at the rate of 3 per cent. per annum." This was adopted.

Considerable discussion took place on a proposal of the Works and Stores Committee to accept tenders of £5978 for the construction of a water-tower, &c., and of £700 for the construction of a stand-pipe, &c., on the Board's land at Shooter's Hill. An amendment was moved by Sir Melvill Beachcroft to the effect that the tender for the tower should not be accepted, and that it should be referred to the Committee to select a design which would allow of the alteration of the tower within the estimate of £5000 already approved by the Board. The amendment was eventually carried by a large majority.

The usual return giving details of supply for the month of August showed that the total average quantity of water sent out daily was 234,843,000 gallons; the mean supply per head per day being 33·4 gallons, compared with 32·9 gallons in August, 1907. In the three preceding months, the figures were 32·1, 34·9, and 35·2 gallons respectively, compared with 31·6, 32·9, and 33·9 gallons in the corresponding months of 1907. The quantity of water in store in impounding reservoirs at the end of August was 8091 million gallons, against 7107 million gallons at the corresponding period last year.

LIVERPOOL WATER SUPPLY.

The Past Year's Work.

The last Meeting of the Liverpool Water Committee for the municipal year is usually made the occasion by the Chairman (Alderman Burgess) for a review of the twelve months' work; and his statement is looked forward to with interest.

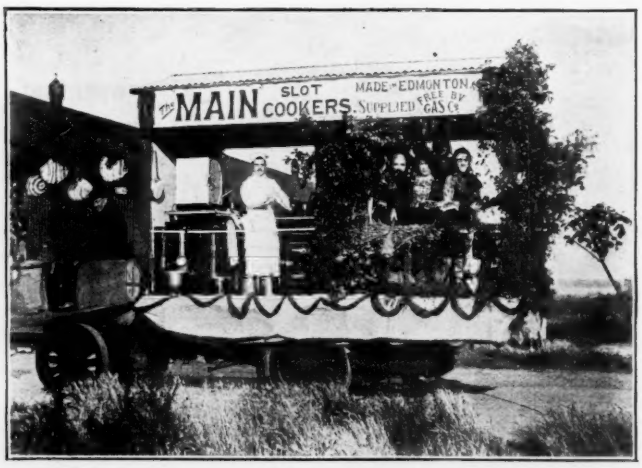
The final meeting for the present year was held last Tuesday; and Alderman Burgess, acknowledging a vote of thanks "for the indefatigable manner in which he had conducted the business of the Committee," said the year had perhaps been, in some respects, not quite as eventful as regarded constructional work as some periods which had preceded it; but it had been by no means devoid of interest and advantage to those who were concerned with the water supply of Liverpool. Within the compulsory limits, not including the town of Chorley, 1881 new tenants had been supplied; and in the same area the estimated population was now 909,000. They were responsible also for the water supply of Chorley, with 30,000 inhabitants; and a population of 177,000 outside their compulsory limits took water from them in bulk. So that 1,109,000 people now looked to Liverpool for their water; and he was glad to say that the supply to this vast population had been constant throughout the year. The total quantity supplied from the Liverpool Water-Works during the twelve months had been 11,616,478,000 gallons, or an increase of 526,735,000 gallons over the previous year—an average increase of 10,130,000 gallons a week, or nearly 1,500,000 gallons daily. The quantity of water sold by meter for trade and manufacturing purposes, which was included in the aggregate quantity mentioned, had been 2,617,426,000 gallons, or an increase of 50,744,000 gallons; and the quantity supplied to shipping had been 251,666,400 gallons, or an increase of 4,228,100 gallons.

As the period under review had been one of general trade depression, he thought this increased use of water for trade and shipping was not only satisfactory, but gratifying. The quantity sold by meter along the lines of the Rivington and Vyrnwy aqueducts had been 1,014,144,000 gallons, which was 10,437,000 gallons more than the preceding year. Over 11 miles of new mains had been laid in the city and suburbs during the year. New works had included the covering of the goit at Rivington, which had been completed, and the making of the Marchnant tunnel, which, as they knew, was driven simultaneously from both ends, and was accomplished with remarkable accuracy, which reflected great credit on the care and skill of the Engineer (Mr. J. Parry) and his staff. The length of the tunnel was 7287 feet entirely in the rock, which in parts was extremely hard. When the Marchnant dam, already in course of construction, had been finished, and another small balancing reservoir had been made at Malpas, the constructional work for the Vyrnwy scheme would be completed. He hoped that these might be finished during the next twelve months; and then no considerable further capital expenditure should be needed until the time came—perhaps twenty years hence—when a third line of pipes had to be laid. Progress on well-defined lines had been made in the work of afforestation, both at Rivington and at Vyrnwy; and the plantations, which were paid for out of revenue, would eventually be a valuable asset of the Corporation. He might say the work that had been done in this direction had been watched with interest by the Board of Agriculture; and he was sure the fact that they hoped during the coming year to do even more than hitherto in the way of tree planting, would meet with general approval. They had already planted some million trees on the two watersheds. Public attention had again been directed lately to the desirability and possibility of Birkenhead being supplied with water from the Liverpool works; and correspondence had taken place between the Town Clerks of the Municipalities on the subject. Questions connected with the water undertaking had also occupied the attention of Parliament. They had succeeded in imposing a needful limit on their obligations to supply by gravitation, and had been able to fix a more equitable scale of charges in the compulsory area of supply outside the city boundaries.

In regard to both these matters, previous applications to Parliament had been unsuccessful; and it was, he thought, a matter for much congratulation that the unjust and anomalous charges under which the city had been penalized for more than forty years had been altered, and the charges fixed on a fair and satisfactory basis. He recognized the devoted work of the Engineer, who never spared himself in his desire to promote the work of the great undertaking in the interest of which his life had been spent. The entire staff of the Water Department did their work well.

THE EDMONTON HOSPITAL CARNIVAL.

The "MAIN" Cookers again to the Front!



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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Eastern District of the Scottish Junior Association held their fifth annual meeting in Edinburgh to-day. The reports of the Council and of the Hon. Treasurer have already been given in the "JOURNAL;" and the only other items of general business to which attention may be directed are the tribute to the memory of the late Sir George Livesey, which was paid by the retiring President, and the resolution to hold two of the quarterly meetings in the coming winter outside of Edinburgh. The latter resolution is a wise one. I have perused the roll of members, and have been struck with the remarkable circumstance that, while the Association possess members so far north as Aberdeen, there are only three members who reside to the south of Edinburgh. One of these is in Leeds; and, of course, his attendance at meetings is out of the question. The two others are within six miles of the city. It thus appears that in this important matter of self-advancement the south-east of Scotland is dormant. I call attention to the situation in the hope that, when the truth is brought home to them, juniors in the South may be stirred up to take an interest in an institution which I have no hesitation in saying it is not good for them to be outside of. The Eastern District have a large membership in Fifeshire; and the members from that side of the Forth attend the meetings with commendable regularity. Members to the north of Dundee find it impossible to travel so far as Edinburgh on an afternoon, and to get home again the same night; and so, for their convenience, it has been arranged to hold a meeting in Dundee. Then, in recognition of the services of the Fife contingent, another meeting is to be held in Kirkcaldy. This thoughtful recommendation to members should be appreciated by them; and it is hoped that the bringing of the benefits of the Association into their midst will have the effect of increasing the membership. It is matter for regret by all that Mr. John R. Moyes has been obliged to resign the position of Hon. Secretary and Treasurer. Mr. Moyes has been such a faithful and energetic Secretary that his successor—Mr. J. Dickson, of Kelty—will, on the one hand, find it an easy matter to take over the duties, but, on the other hand, he has a high standard to work up to. The address of the new President—Mr. A. Morton Fyffe, of Dundee—was a powerful document, dealing in detail, in the first part, with some of the latter-day developments in gas production, and in the second portion rising into the general field, and conveying a series of reflections which are so comprehensive, so appropriate to the occasion, and so well put, that they stamp the author as one who stands high in the matters both of observation and practice. The Association are to be congratulated upon the possession of a member whose intellectual gifts are of so high an order, and are to be complimented upon their wisdom in selecting him to fill their highest office. He will, without doubt, adorn it.

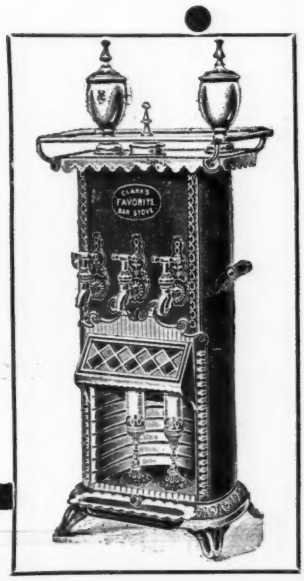
The Corporation of Greenock the other day resolved to advertise for a Gas Manager, to succeed Mr. W. Ewing, who has resigned. The intimation to this effect which I have seen adds that "it was thought desirable that the successful applicant should be able to take up his duties about the middle of November." The advertisement has already appeared in the "JOURNAL" and elsewhere. It will be observed that the Corporation have not fixed the salary, but require applicants to state the amount they expect. This looks like a bid for a cheap man. I may state, for the information of applicants, that when Mr. Ewing was appointed, in October, 1900, the salary was £400 a year and a free house.

At Elgin, on Wednesday, the new gasholder of 200,000 cubic feet capacity, which has been erected for the Corporation by the Barrowfield Iron-Works, Limited, of Glasgow, was inaugurated by Provost Christie turning on the gas. Before doing so, the Provost said it was somewhat interesting to compare the storage between the time that the works were constructed in 1831 and now. At that date there were two small holders with a total capacity of something like 15,000 cubic feet. In 1858, this was added to by the construction of the smaller of the present holders; making the total storage capacity 35,000 cubic feet. When the town took over the gas-works in 1880, they built another and larger holder; but the accommodation was still only 80,000 cubic feet. The new holder gave them storage equal to the maximum consumption for thirty hours. Including the site and foundations, the cost of it was about £4400. The gas having been turned on, Bailie Gordon, the Convener of the Gas Committee, unveiled a brass memorial tablet, the inscription upon which contained the names of the Contractors, and of the Provost, the Convener, and the Gas Manager—Mr. James Kay. A cake and wine banquet was afterwards served in the Lady Gordon Cumming Hall, at which a number of toasts were honoured. Since they took over the gas works, the Town Council have reduced the price of gas from 6s. 8d. to 3s. 9d. per 1000 cubic feet, at which figure it at present stands.

On the evening of Monday, the Town Council of Falkirk held a special meeting, at which they imposed the assessments for the year, which, for police and other purposes, were increased by 3d. per £1. The Finance Committee recommended that the price of gas for lighting purposes should be 3s. 2d. per 1000 cubic feet, as compared with 2s. 10d.—an increase of 4d.; and for power purposes 2s. 9d., as compared with 2s. 5d. The price for cooking and heating, it was recommended, should be the same as for lighting, as compared with 2s. 7d.; and for prepayment meters 3s. 6d., as compared with 3s. 1d. These recommendations were unanimously adopted. As bearing upon this matter, it may be stated that a very large meeting was held on Wednesday evening, under the auspices of the Burgh Ratepayers' Vigilance Association, at which Mr. R. Sinclair said the total cost of the gas undertaking, including the old gas-works, was £201,000 odd. Yet the capital expenditure on the works for this year alone was over £20,000, and the capital expenditure for the previous year was something like £11,000. They had to judge of their gas-works not from what they paid for them, but the results they received from them. Had they good results this year? They had not. There was a paper deficiency on them of £2700. But this was not the real deficiency. Including other items

A FEW SPECIALTIES

FOR THE COMING SEASON



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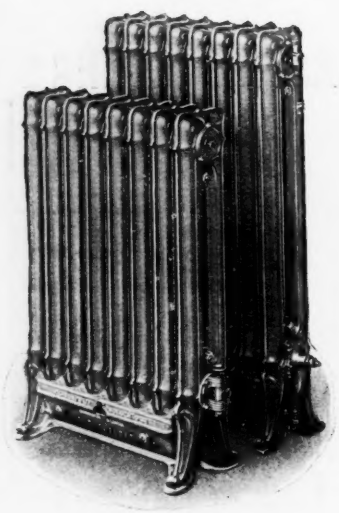
which had not been taken into account, the deficiency amounted to nearly £4000. This year 2000 tons more coal had been purchased, and yet they had sold no more gas. They also found that the quality of the gas made from the coal was so poor that they had to pay £360 for extra benzol to increase the illuminating power. Referring to these statements at a meeting of electors of the West Ward last night, Bailie Bogle, the Convener of the Gas Committee, said he entered the Town Council two years after the Municipality acquired the works. In due course he was asked to become Gas Convener. He eventually accepted the position; but he then pointed out that at no future time would certain things that had been done at the gas-works be laid on his shoulders. The time was now come when he was supposed to bear a burden he never incurred. The estimates last year were made up as carefully as possible; and he denied that they were other than good. Coal cost them 2s. 1½d. per ton more than in the year before, which meant that £2848 more had to be paid for coal. Yet they only increased the price of gas 1d. per 1000 cubic feet, but they decreased their price for gas for cookers and heaters 3d. per 1000 cubic feet—showing that, though they assessed 1d. per 1000 cubic feet more, they only realized £358 to meet £2848. They would thus see that the gas consumers had a present, by anticipation, of £2400, or, in other words, very nearly the net debit balance for the year which had finished, and which amounted to £2796. It might be asked why they did not increase the price of gas so as to meet what they knew would be required—namely, by 5d. per 1000 cubic feet. They were wishful, knowing the times they lived in, not to make things any harder than they possibly could, and they were hopeful that some of their residuals would fetch more money. The estimate was based on an output of 8500 cubic feet of gas per ton of coal, but there was a leakage in the retorts amounting to £750. Then they lost £610 by a way they could not anticipate—that was, by the Carron Company leaving them. They had also paid about £800 out of revenue, which should have been placed to capital. The retorts had now been renewed, and since May had produced an average of 9000 cubic feet of gas per ton of coal, while just now the average was 9500 feet. After the old retorts had been put in, it was found that they had been built upon a foundation of moss. The result was that, though the foundations had been strengthened by concrete and iron columns, the retorts became cracked, and the gas escaped and was consumed in the furnaces. They would not have required to raise the price of gas at this time, had it not been for the renewals of retorts, amounting to about £1900, and other items, bringing the total to nearly £2500. It had been said outside that they should have had a saving of £1300 last year with regard to their coal cartage. The old conditions involved a charge of 1s. per ton of coal delivered at the gas-works. The additional machinery and labour required for the manipulation of the coal at the works cost them £1100 per annum—a saving of only £200 or £300; and this was more than met by the additional quantity of benzol required to keep the mains free of naphthalene. Their net capital for the whole gas undertaking at the present time was £197,000. Against this, in real assets, they had the new gas-works, £76,000. In sinking fund and interest, they had £25,000, and a reserve fund of £4000; and they estimated the value of their mains throughout the whole lighting district at £40,000. This left a balance of £52,000, which might be regarded as the goodwill of the business. Twelve years ago, when the business was acquired, the value of the works was estimated at £30,000. The town purchased them for £77,000. This represented the goodwill at £47,000. There were then only 4000 consumers; there were 8000 to-day. They had now huge works, where the primitive means and methods of operation in the old works could not obtain. Fault had been found with the men employed. It was said there were too many of them, and that there were too many officials. Was it not in the interest of the Gas Manager to keep his expenses as low as possible? He utterly refused to consider the body which had been constituted in Falkirk as symbolical of all the feeling in the town. They found two or three men—and he could name them—who had been the cause of the whole of the turmoil. I have given these remarks at greater length than, perhaps, I should, but I am anxious that the situation should be explained by those who are responsible for it. This responsibility does not lie with the present Manager—Mr. W. Wilson. The works were erected before he came to them, and any defects which have been discovered cannot be attributed to anything he has done. To make further comment might reflect on the memory of the departed; but it is possible to account for things being not what they should have been without doing that ungracious act. The Corporation squabbled for seven years over the question of a site for the new gas-works; and when they selected the present site at Thornhill, the erection of the works had to be gone about in a hurry. This is the whole explanation that is necessary. There is an irreconcilable body in Falkirk at present who wish to condemn everything in the municipal world; and the gas undertaking is getting a rub along with the others. But the mistakes of the past have been remedied; and the fortunes of the undertaking rest now upon good management.

The Larkhall Gas Company, Limited, have reduced the price of gas by 5d., making it 2s. 11d. per 1000 cubic feet.

The Town Council of Paisley have just equipped the burgh gas-works with the Radcliffe process for the purification of effluent liquors. The process is used in connection with the sulphate of ammonia plant; but Mr. George R. Hislop, the Engineer, has arranged that the waste liquors in the manufacture of gas are also dealt with. Purification takes place continuously and automatically; and after going through the process all the waste liquors which are objectionable, both in composition and appearance, are so purified as to look almost as clear as drinking water. It is claimed for the system that the passing of the purified effluent into the sewers assists the purification of sewage in a marked degree; while a portion of it might also, in so far as the gas-works are concerned, be used for the quenching of coke and other purposes, thereby effecting a saving in the charge for water.

The Cowdenbeath Gas Company, Limited, held their annual meeting a short time since, when a very satisfactory state of affairs was reported by the Chairman. It may be remembered the Company spent a large sum last year in erecting a new gasholder and coal and coke handling plant; and the need of these extensions has been proved by the report



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The Rev. J. H. DODDS, writes:—

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Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

of the Manager (Mr. J. B. Scott), which shows an increase of 4 million cubic feet, equal to 23 per cent., while for the first four months of the current year the Chairman stated that the increase had been over 32 per cent. Since the starting of the Company seven years ago, the make of gas has risen from 3 to 22 millions; and the number of consumers from 73 to upwards of 1800. Some time ago it was reported that the Town Council were proposing to purchase the concern; but it is understood that the matter has been shelved. No doubt the ratepayers consider they are being fairly well served under the present management.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 10.

Sulphate of Ammonia.

Demand has been fairly well maintained, and parcels offered have found buyers at fully last week's prices. Leith continues to be the best market. The closing quotations are £11 3s. 9d. to £11 5s. per ton f.o.b. Hull, £11 5s. to £11 6s. 3d. per ton f.o.b. Liverpool, and £11 8s. 9d. per ton f.o.b. Leith. Interest in the forward position is discouraged by the premium demanded by makers. £11 17s. 6d. per ton for January-June has not been reported paid; but business has been done at £11 8s. 9d. per ton for delivery up to the end of the year.

Nitrate of Soda.

This article is quiet at 9s. 6d. per cwt. for 95 per cent., and 9s. 9d. for refined quality.

LONDON, *Oct.* 12.

Tar Products.

The markets for tar products have been steady throughout the past week. Pitch has been very firm, and prices have advanced considerably all round. For prompt delivery, 22s. 6d. is reported to have been paid in London, and 22s. on the east coast; while on the west coast prices are also very firm. There is a good demand from Belgium, and equal to 23s. 6d. England is stated to have been paid in this place for January-June delivery. The French buyers are also making inquiries for delivery over the first six months of next year; and South Wales buyers are inclined to do business if they can obtain offers on reasonable terms. There is a decidedly better tone in the market, and prices appear likely to advance still further. Creosote is firm. In London, some quantity was sold at 2⅞d. for immediate delivery; but this was not one of the best makes, as these could not be secured under 2¾d. for prompt, or 2⅞d. for forward delivery. In the Midlands, makers ask 2¾d. for prompt delivery; but for forward 2⅞d. is the lowest figure. In the North, business has been done at 2¾d. for prompt delivery, and 2⅞d. for delivery all over next year. Benzol is quiet, and values are practically unaltered. Toluol is firm, but there is not very much offering. Solvent naphtha is steady, and the London makers in particular appear to be well sold. Heavy naphtha is quiet. There is a certain amount of inquiry for next year. Carbolic acid is still depressed; but the bottom appears to have been reached for the present. Naphthalene is quiet, and orders are difficult to obtain. Creosote salts maintain their price. Tar is naturally improving in value, with the brighter outlook for tar products generally.

The average values during the week were: Tar, 12s. 9d. to 16s. 9d., *ex* works. Pitch, London, 22s. 6d. to 23s. 6d.; east coast, 22s. to 23s.; west coast, 21s. 6d. to 22s. 6d. f.a.s. Benzol, 90 per cent., casks included, North, 6¼d. to 6⅜d.; London, 7¼d.; 50-90 per cent., casks included, North, 6⅜d. to 7d.; London, 7⅛d. Toluol, casks included, London, 8¼d. to 8⅜d.; North, 8¼d. to 8½d. Crude naphtha, in bulk, North, 3¼d. to 3⅜d.; London, 3⅜d. to 3½d.; solvent naphtha, casks included, North, 9¼d. to 9⅜d.; London, 10⅛d. to 10⅜d.; heavy naphtha, casks included, North, 9½d. to 9⅝d.; London, 10⅛d. to 10⅜d. Creosote, in bulk, London, 2¾d. to 2⅞d.; North, 2¾d. to 2⅞d. Heavy oils, in bulk, 3d. to 3 1/16d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 2d.; west coast, 1s. 1¼d. Naphthalene, £3 10s. to £7 10s; salts, 32s. 6d. to 35s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady during the past week, and there has been some inquiry in London for high-test qualities. The Gas Companies maintain their price of £11 15s. for delivery to the end of the year; and it is reported they declined this price for January-April. Ordinary makes, however, are still to be secured in London, on Beckton terms, for prompt delivery at £11 5s. to £11 7s. 6d. In Hull, £11 5s. has been refused for one of the best makes; and manufacturers are asking £11 6s. 3d. In Liverpool, prices are about £11 7s. 6d.; while in Leith, though second-hand business has been done at £11 10s., makers report having declined this price.

COAL TRADE REPORTS.

Northern Coal Trade.

In the coal trade, there is now a lessened export of fuel to the Baltic; but the home shipments are increasing. The steam coal trade shows a falling off in the demand, and the prices are easier, more especially for forward delivery. Best Northumbrian steams are quoted from about 12s. 4½d. to 12s. 6d. per ton f.o.b., according to the time of delivery. Second-class steams vary from about 10s. 9d. to 11s. 3d., and steam smalls from about 4s. 9d. to 6s. In the gas coal trade, the demand is steadily increasing; and the shipments to the South are now becoming full. Durham gas coals are being quoted from about 10s. 3d. to 11s. 3d. per ton f.o.b., with the customary addition for "Wear specials." Some sales of gas coals are reported for export to Hamburg over next year. The price is said to be between 9s. 3d. and 9s. 7½d. per ton f.o.b.; but the exact figures are not yet obtainable. One or two

Richmond's

"A.B.C."

Gas Fires.

(1) They have attracted the attention of Gas Authorities because they are a Series of Fires of different design and shapes, highly efficient and economical, and having all **wearing parts** removable by hand and **interchangeable,** fire with fire.

(2) They have attracted the attention of the Consumer because they are perfectly adapted to meet the requirements of any rooms of a house. They can be had in our famous "Porcellanite" finish, blending with any scheme of decoration. They are unique, and have undoubtedly made **Hiring out of Fires** possible to every Gas Undertaking.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

smaller lots are now being negotiated for; but buyers forward seem to look for lower figures, and the abundance of second qualities of gas coal tend to make prices easier. Coke is steady, and gas coke is in demand; but the production is now steadily increasing. Good gas coke is from about 17s. to 17s. 6d. per ton f.o.b.

Scotch Coal Trade.

Steadiness has been the characteristic of the market. Coal for export has been in better demand, particularly ell, but splint has also been in request. Steam coal is steady. The smaller sorts are neglected. The prices quoted are: Ell, 10s. 6d. to 12s. per ton f.o.b. Glasgow; splint, 11s. 3d. to 11s. 6d.; steam, 10s. 3d. to 10s. 6d. The shipments for the week amounted to 352,587 tons—an increase of 28,697 tons upon the previous week, and of 44,629 tons upon the same week of last year. For the year to date, the total shipments have been 10,997,213 tons—a decrease upon the corresponding period of 278,672 tons.

NEW CATALOGUES, ETC.

The Parkinson Stove Company, Limited, of Birmingham, have forwarded a copy of an attractively prepared pamphlet entitled "Warmth without Waste." This deals with the advantages of installing the Parkinson gas-heated steam-radiator, and includes several letters expressing satisfaction with the apparatus—two of them being from gas managers. Among a list of some of the places where the radiators are in use are to be found the Guildhall and numerous hotels, churches, schools, halls, and other large buildings. The Company also send neatly got up price lists of their new season's fires, &c.

We have received from Messrs. John Russell and Co., whose works for the manufacture of gas-fittings are at Brookfields, Birmingham, a copy of their latest list entitled "Modern Lighting by Gas." The word "list," however, does not adequately describe this production, which is in reality a cloth-bound foolscap volume extending to about 150 pages, practically every one of which is filled with illustrations of gas-fittings of the most up-to-date and approved types. The selection of brackets, chandeliers, hall lights, &c., for both upright and inverted gas-burners, covers the widest possible range. The firm, it may be mentioned, have depôts in London, Leeds, Manchester, and Bristol.

Further Gas Powers for the Coventry Corporation.—At the meeting of the Coventry Town Council last Wednesday, the recommendation of the Gas Committee that application should be made to the Local Government Board for a Provisional Order to confer additional gas powers, to which reference was made in the "JOURNAL" last week (p. 71), was adopted.

Sales of Shares.—At a recent sale, by Messrs. Field and Palmer, of shares in the Portsmouth Water Company, some original £10 shares (10 per cent.) fetched from £24 7s. 6d. to £24 10s. each; £5 shares, entitled to a like dividend, £12 5s. to £12 7s. 6d. apiece; £5 shares carrying 7 per cent., £8 7s. 6d. to £8 10s. per share; £5 shares of the 1883 issue, £8 7s. 6d. to £8 12s. 6d. each; and £250 of 3 per cent. perpetual debenture stock, £215. On the same occasion, £10 shares in the Portsmouth Water-Fittings Company realized £7 15s. each.

Reductions in Price.—The Shoeburyness Urban District Council have decided to reduce the price of gas to 4s. 3d. per 1000 cubic feet as from the beginning of next year. The price of gas at Pembroke Dock has been reduced from 4s. 2d. to 4s. per 1000 cubic feet. At the last meeting of the Newry Urban District Council, the Chairman of the Gas Committee (Mr. T. P. Ledlie) announced that at their last meeting the Committee had decided to reduce the price of gas by 5d. per 1000 cubic feet—from 3s. 9d. to 3s. 4d., which was the lowest point it had ever reached in the town. The price of gas for engines will be 20 per cent. less.

Stockport Gas Committee's Proposed Visit to London.—At the meeting of the Stockport Town Council last Wednesday, the Chairman of the Gas Committee, in moving the adoption of the minutes, asked to be allowed to have deleted one resolving that the members visit the Franco-British Exhibition for a period of two days. He said the resolution seemed to have created an impression that the Committee were going for a two days' trip at the expense of the ratepayers. He thought the Committee might have been trusted, considering the good work they had carried out for many years, to do what was right in the matter. But they could not prevent people talking; and he hoped his fellow-members of the Committee would not blame him for taking the matter back. The Council agreed to this being done.

Forthcoming Sales of Gas and Water Stock.—It will be seen from announcements in another part of the "JOURNAL," that Messrs. A. & W. Richards will resume their auction sales at the Mart, Tokenhouse Yard, E.C., on the 20th inst. On that occasion they will offer, under instructions from Directors, fresh issues of new ordinary "B" stock and 4 per cent. perpetual debenture stock of the Southend Gas Company, and of similar debenture stock and new ordinary stock of the Great Yarmouth Water Company. At the same time they will offer for sale, for private owners, parcels of preference stock and shares in the Swanage Gas and Water Company and the High Wycombe Gas Company. From another announcement it will be seen that Messrs. Alexander, Daniel, and Co. will offer for sale at Bristol, on the 29th inst., £15,000 of 7 per cent. maximum consolidated ordinary stock of the Bristol Water-Works Company, at the reserved price of £138 per £100 of stock.

The Imperial Continental Gas Association propose to pay a dividend of 4 per cent. for the six months ending the 30th of June.

The Royal Bombay Yacht Club have placed the order for all the cooking apparatus with Messrs. R. & A. Main, Limited, of London and Glasgow.

In our advertisement columns last week, applications were invited by the Corporation of Greenock for the position of Gas Manager. According to a local paper, a member of the Corporation is a candidate for the appointment.

Warmth Without Waste!

Is the title of

PARKINSON'S RADIATOR

booklet. It is a pamphlet descriptive of all that is best in gas-heated steam Radiators, and we shall be happy to send you a supply to distribute among your consumers.

NOTE.—These radiators are **provided with** *a* **flue outlet** *when required for certain positions, as* **supplied last year.**

THE

PARKINSON STOVE CO., LIMITED,

BIRMINGHAM.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it.
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact.

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

LEAKAGE DETECTOR, &c. No. 5001.
ENGINEER AND MANAGER. Devonport Gas Department. Applications by Oct. 24.
MANAGER. Greenock Gas Department. Applications by Oct. 21.
IMPROVER (GAS FITTING). Ringwood Gas Company.
WORKING MANAGER. W. L. S. Hack. Swindon.
WORKING MANAGER. Sharpness Docks Gas-Works. Applications by Oct. 16.

Situation Wanted.

CLERK OR COLLECTOR. No. 5003.

Patents to Sell and Licences to Manufacture.

IMPROVEMENTS IN METERS. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Meetings.

DANISH GAS COMPANY. London Agency. Oct. 30, 2.30 o'clock.
IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel. Nov. 3. 2.30 o'clock.

Plant (Second-Hand) for Sale.

WATER-GAS PLANT. No. 5002.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. Oct. 26.
BRIGHTON AND HOVE GAS COMPANY. Oct. 26.
BRISTOL WATER COMPANY. Oct. 29.
GREAT YARMOUTH WATER COMPANY. Oct. 20.
HIGH WYCOMBE GAS COMPANY. Oct. 20.
ILFORD GAS COMPANY. Nov. 3.
LITTLEHAMPTON GAS COMPANY. Oct. 27.
MITCHAM AND WIMBLEDON GAS COMPANY. Oct. 26.
PINNER GAS COMPANY. Oct. 26.
SEVENOAKS WATER COMPANY. Oct. 31.
SOUTHEND GAS COMPANY. Oct. 20.
SOUTHEND WATER COMPANY. Nov. 3.
SWANAGE GAS AND WATER COMPANY. Oct. 20.
TICEHURST WATER AND GAS COMPANY. Oct. 21.
WEST KENT GAS COMPANY. Oct. 26.

TENDERS FOR

Coke.

HUDDERSFIELD GAS DEPARTMENT. Tenders by Oct. 14.

Fire-Clay Goods.

LLANDUDNO GAS DEPARTMENT. Tenders by Oct. 31.
SHEFFIELD GASLIGHT COMPANY. Tenders by Nov. 2.

Lighting Concession.

TOWN OF TOURNAY (BELGIUM). Tenders by Jan. 1, 1909.

Oil for Gas Making.

SMETHWICK GAS DEPARTMENT. Tenders by Oct. 28.

Oxide of Iron.

BLACKBURN GAS DEPARTMENT.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 113.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19—20	..	5 0 0
268,324	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
310,000	Stk.	July 15	4	Do. 4 p.c. Deb.	99—102	..	3 18 5
200,000	5	May 29	6¼	Bombay, Ltd.	5⅞—6¼	..	5 4 0
40,000	5	,,	6¼	Do. New, £4 paid	4—4⅛	..	5 15 7
50,000	10	Aug. 27	14	Bourne-mouth Gas and Water Pref. 6 p.c.	28—29	..	4 16 6
					B 7 p.c.		
					16½—16⅝	..	4 3 7
					15—16	..	3 15 0
51,810	10	,,	7				
53,200	10	,,	6				
380,000	Stk.	Aug. 13	12½	Brentford Consolidated	244—249	..	5 0 5
300,000	,,	,,	9¾	Do. New	183—188	+1	5 1 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,250	,,	June 12	4	Do. 4 p.c. Deb.	100—105	..	3 16 2
220,000	Stk.	Sep. 11	0⅔	Brighton & Hove Orig.	205—210	..	5 2 4
246,320	,,	,,	7⅔	Do. A. Ord. Stk.	150—155	..	5 0 0
460,000	20	Mch. 27	10	British	42—43	..	4 13 0
109,000	Stk.	Aug. 27	6	Bromley, Ord. 5 p.c.	113—116	..	5 3 5
165,700	,,	,,	4½	Do. do. 3½ p.c.	84—86	..	5 4 8
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	11½—11⅝	..	5 19 1
350,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 15	7½	Cagliari, Ltd.	24—25	..	5 16 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4—6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	5—7	..	6 8 7
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0
103,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Aug. 13	5	Chester 5 p.c. Ord.	108½—110½	..	4 12 7
1,493,280	Stk.	Aug. 27	5⅛	Commercial 4 p.c Stk.	106—111	..	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do.	103—106	..	4 14 4
475,000	,,	June 26	3	Do. 3 p.c. Deb. Stk.	82—84	..	3 11 5
800,000	Stk.	June 12	6½	Continental Union, Ltd.	108—113	..	5 15 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—142	..	4 18 7
460,170	Stk.	—	5	Derby Con. Stk.	122—124	..	4 0 8
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 10 2
148,995	,,	Sep. 30	5	East Hull 5 p.c. Ord.	97—100*	..	5 0 0
486,030	10	July 15	12	European, Ltd.	23½—24½	+⅛	5 0 0
354,060	10	,,	12	Do. £7 10s. paid	17—18	+⅛	5 2 10
15,182,590	Stk.	Aug. 13	4/10/8	Gas-light and Coke Consolidated	4 p.c. Ord.	97—99	−1⅛	4 10 8
					3½ p.c. max.	87—89	..	3 18 8
2,600,000	,,	,,	3½		4 p.c. Con. Pref.	105—107	..	3 14 9
3,799,735	,,	,,	4		3 p.c. Con. Deb.	85—87	..	3 8 11
4,193,975	,,	June 12	3	Hastings & St. L. 3½ p.c.		93—95	..	4 16 11
258,740	Stk.	Sep. 11	4⅔	Do. do. 5 p.c.		112—115	..	5 8 8
82,500	,,	,,	6½	Hongkong & China, Ltd.		18—19	..	5 15 9
70,000	10	Apl 29	11	Imperial Continental		182—184	..	4 7 0
4,940,000	Stk.	May 14	8	Do. 3½ p.c. Deb. Red.		94—96	..	3 12 11
473,600	Stk.	Aug. 13	3½	Lea Bridge Ord. 5 p.c.		116—120	..	5 0 0
195,242	Stk.	Aug. 27	6	Liverpool United A		227—229	..	4 7 4
				Do. B		166—168	..	4 3 4
				Do. Deb. Stk.		104—106	..	3 15 6
				Malta & Medn., Ltd.		4⅛—4⅜	..	6 6 4
				Met. of 5 p.c. Deb.		100—102*	..	4 18 0
				Melbourne 4½ p.c. Deb.		99—101*	..	4 9 1
				Monte Video, Ltd.		11⅝—12⅛	..	5 12 0
				Newc'tle & G'tesh'd Con.		107⅛—108½	..	4 5 3
				Do. 3½ p.c. Deb.		90—92	..	3 16 1
				North Middlesex 10 p.c.		19½—20½	..	4 17 6
				Do. 7 p.c.		13—14	..	5 0 0
				Oriental, Ltd.		140—143	..	5 11 11
				Ottoman, Ltd.		6—6⅛*	..	6 3 1
				Primitiva Ord.		5⅞—6⅛	..	5 12 0
				Do. 5 p.c. Pref.		4⅞—5⅛	..	4 17 7
				Do. 4 p.c. Deb.		97—99	..	4 0 10
				River Plate Ord.		13¼—13⅝	..	5 16 5
				Do. 4 p.c. Deb.		92—94	..	4 5 1
				San Paulo, Ltd.		13¼—14*	..	5 14 4
				Do. 5 p.c. Deb.		49—51	..	4 18 0
				Sheffield A		239—241	..	4 3 0
				Do. B		239—241	..	4 3 0
				Do. C		238—240	..	4 3 4
				South African		13⅛—14⅛	..	6 17 11
				South Met., 4 p.c. Ord.		120—122	..	4 7 4
				Do. 3 p.c. Deb.		84—86	..	3 9 9
				South Shields Con. Stk.		152—154	..	5 3 10
				S'th Suburb'n Ord. 5 p.c.		115—118	..	4 10 4
				Do. 5 p.c. Pref.		117—122	..	4 2 0
				Do. 5 p.c. Deb. Stk.		120—125	..	4 0 0
				Southampton Ord.		108—113	..	4 8 6
				Tottenham and Edmonton	A 5 p.c.	132—137	..	4 18 6
					B 3½ p.c.	105—108	..	4 17 3
					4 p.c. Deb.	100—105	..	3 16 2
				Tuscan, Ltd.		10—10½	..	7 12 4
				Do. 5 p.c. Deb. Red.		99—101	..	4 19 0
				Tynemouth 5 p.c. max.		104—105	..	4 15 3
				Wandsworth and Putney	B 3½ p.c.	125—130	..	5 0 0
					3 p.c. Deb. Stk.	73—78	..	3 16 11
				West Ham 5 p.c. Ord.		101—104	..	4 18 6
				Do. 5 p.c. Pref.		118—123	..	4 1 3
				Do. 4 p.c. Deb. Stk.		100—105	..	3 16 2

Prices marked * are "Ex div."

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
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OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.
J. WILSON, Pleasant Grove, York Road, King's Cross, LONDON, N.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
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SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
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FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, Sept. 22, p. III. of Centre.
ALDRIDGE AND RANKEN,
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BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 7, PARK SQUARE, LEEDS.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

DESSAU PATENT VERTICAL RETORTS.
FOR list of Installations, see "Journal," Oct. 6, p. I. of Centre.
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WANTED, a Steady Young Man as an IMPROVER to the Gas-Fitting. Wages £1 per Week.
Apply, stating Age, and enclosing References, to the MANAGER, Gas-Works, Ringwood, HANTS.

WANTED, immediately, for a Small Gas-Works in Wiltshire, a WORKING MANAGER. Annual make about 2 Millions. The Manager will have to undertake all Duties, both at the Works and Distribution.
Apply to the undersigned, on or before Saturday, Oct. 24, 1908.
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17, Queen Street, Swindon.

WANTED, a Gas Manager for the Gas Undertaking of the Corporation of Greenock, who will require to give his whole Time and Attention to the duties of the Appointment. A good House is provided (rent free) for the Manager.
Applications marked "Gas Manager," stating Age, Experience, and Salary expected, with Testimonials, may be lodged with the Subscriber not later than the 21st inst., from whom a list of duties may be obtained.
C. MACCULLOCH,
Town Clerk.
Greenock, Oct. 2, 1908.

COUNTY BOROUGH OF DEVONPORT.
GAS ENGINEER AND MANAGER.
THE Devonport Corporation invite APPLICATIONS for the Appointment of an Experienced and Qualified Man as ENGINEER and MANAGER of their Gas-Works.
Salary, £350 per Annum; increasing by annual increments of £25 to £450. Age not to exceed 45 Years.
Appointment determinable by Three Months' notice on either side.
The Gentleman appointed must devote the whole of his time to the duties of the Office.
Applications, stating Age, Experience, and Qualifications, with *copies* of not more than Three recent Testimonials, to be sent to me on or before Saturday, the 24th day of October, 1908, endorsed "Gas Engineer."
R. J. FITTALL,
Town Clerk.
Municipal Offices, Devonport,
Oct. 10, 1908.

SHARPNESS NEW DOCKS AND GLOUCESTER AND BIRMINGHAM NAVIGATION COMPANY.
THE Directors invite Applications for the post of WORKING MANAGER for their Gas-Works at Sharpness Docks. Output, about 7 Million Cubic Feet per Annum.
Candidates must be experienced Men with thorough Knowledge of the Manufacture, Testing, and Distributing of Gas, and must be practised Gas Fitters.
The Person appointed will be required to devote the whole of his time to the Service of the Company, and to commence his duties on the 1st of November next.
Salary, £100 per Annum, with House, Coal, and Gas Free.
Applications, with *copies* of Testimonials, stating Age and Qualifications, to be made by letter only, addressed to the undersigned, on or before the 16th inst., endorsed "Gas Manager."
HUBERT WADDY,
General Manager and Secretary.
Dock Office, Gloucester,
Oct. 8, 1908.